5-4120-359-14

TECHNICAL MANUAL

TM 5-4120-359-14

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

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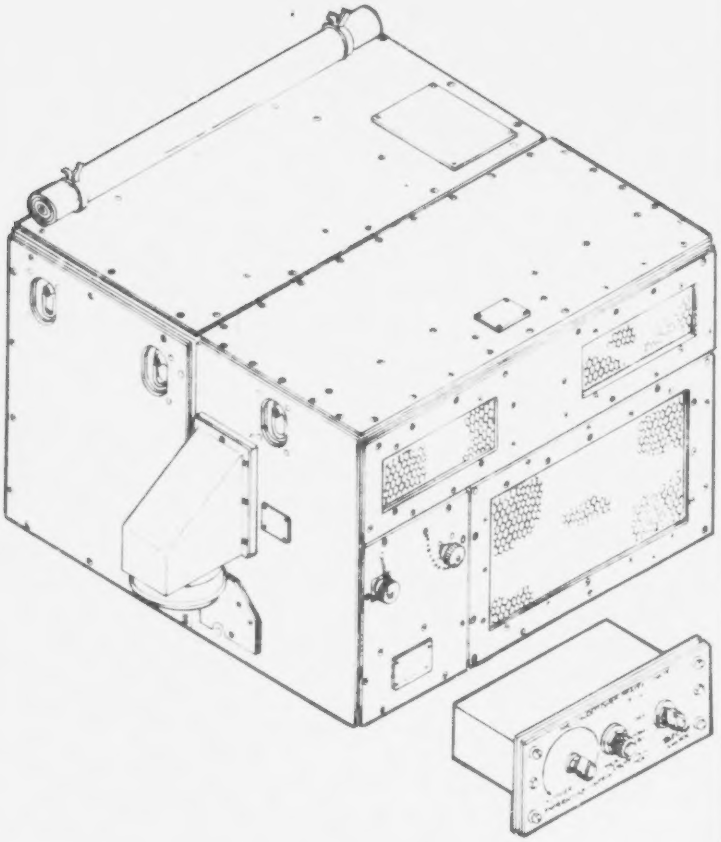

AIR CONDITIONER
SPLIT PACKAGE

18,000 BTU/HR COOLING
30,000 BTU/HR HEATING
208 VOLT, 3 PHASE 400 HERTZ
KECO MODEL F18H4-2
(4120-01-069-1321)

D101.11:

HEADQUARTERS, DEPARTMENT OF THE ARMY
25 FEBRUARY 1982

This copy is a reprint which includes current pages from Change 1.

TM 5-4120-359-14
C 1

CHANGE No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 26 January 1984

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

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TM 5-4120-359-14, 25 February 1982, is changed as follows:

1. Remove and insert pages as indicated below:

	Remove pages	Insert pages
Chapter 2	2-5 and 2-6	2-5 and 2-6
	2-9 and 2-10	2-9 and 2-10
Chapter 3	3-17 and 3-18	3-17 and 3-18
	3-19 and 3-20	3-19 and 3-20
Chapter 4	4-1 and 4-2	4-1 and 4-2
Appendix	B-17 and B-18	B-17 and B-18

2. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

3. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25C, Operator Maintenance Requirements for Environmental Equipment Air Conditioners, 18,000 BTU, Compact.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, and keep away from sparks or flame. Use goggles, gloves, and apron when appropriate.

WARNING

Do not use steam to clean coil.

WARNING

Do not use steam, open flame, heat gun, or any other high-temperature heat source to thaw an iced coil. Thaw an iced coil with a lamp bulb (75-watt maximum), hair drier, electric fan, or by leaving the unit shut down until ice melts.

WARNING

Compressed air used for cleaning purposes will not exceed 30 PSI (2.1 kg/cm^2). Do not direct compressed air against the skin. Use goggles or full face shield.

WARNING

Avoid inhaling fumes and burns from any acid formed by burnout of oil and refrigerant. Wear gas mask if area is not thoroughly ventilated. Wear protective goggles or glasses to protect eyes. Wear rubber gloves to protect hands. Use care to avoid spilling compressor burnout sludge. If sludge is spilled, clean area thoroughly.

WARNING

Avoid injury by using adequate equipment and personnel to remove compressor from frame. The compressor weighs 75 pounds (34 kg).

WARNING

Clean parts in a well ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvent. Wash exposed skin thoroughly.

Dry cleaning solvent (Fed. Spec. P-D-680) used to clean parts is potentially dangerous to personnel and property.

Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

Wear eye protection when blowing solvent from parts. Air pressure should not exceed 30 psig (2.1 kg/cm^2).

Assure the industrial process has been evaluated by the Medical Service Bioenvironmental Engineer.

Waste treatment/disposal must be approved by the Medical Service Bioenvironmental Engineer and Civil Engineer.

WARNING

Solutions will be disposed of in accordance with local State Water Pollution Control Laws. Consult local Medical Services for guidance.

WARNING

HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT
may result if personnel fail to observe safety precautions.

Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the input power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections of 208 volts ac input when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

Do not operate the equipment without all grilles, guards, louvers, and covers in place and tightly secured.

Warning: Do not be misled by the term "low voltage." Potentials as low as 50 volts may cause death under adverse conditions.

WARNING

Disconnect input power to the air conditioner before performing any maintenance to the electrical system. Voltages used can be lethal. Shutting the unit off at the control module does not disconnect power to the various components of the air conditioner.

WARNING

Allow heaters to cool before touching. Severe burns can result from touching hot heaters.

WARNING

Do not allow anyone under equipment suspended from a lifting device.

Do not allow the unit to swing while suspended from a lifting device. Failure to observe this warning may result in injury to personnel and damage to the equipment.

WARNING

- The covers, grilles, and screens installed on this unit are there for a purpose.
- Do not operate this unit with them off or open unless the instructions tell you to. When this is necessary, do so with care.

WARNING

The burning of polyurethane foams is dangerous.

Due to the chemical composition of a polyurethane foam, toxic fumes are released when it is burned or heated.

If it is burned or heated indoors, such as during a welding operation nearby, you should take care to ventilate the area thoroughly. An exhaust system like that of a paint spray booth should be used.

Air-supplied respirators, approved by the National Institute for Occupational Safety and Health Administration or the United States Bureau of Mines, should be used for all welding in confined spaces and in places where ventilation is inadequate. Persons who have chronic or recurrent respiratory conditions, including allergies and asthma, should not work in these areas.

WARNING

DANGEROUS CHEMICAL
is used in this equipment
DEATH

or serious injury may result if personnel fail to observe proper safety precautions. Great care must be exercised to prevent contact of liquid refrigerant, or refrigerant gas discharged under pressure, with any part of the body. The extremely low temperature resulting from the rapid expansion of liquid refrigerant, or refrigerant gas released under pressure, can cause sudden and irreversible tissue damage through freezing. As a minimum, all personnel must wear thermal protective gloves and a face shield or goggles when working in any situation where refrigerant contact with the skin or eyes is possible. Application of excessive heat to any component in a charge system will cause extreme pressure that may result in a rupture, possibly explosive in nature. Exposure of Refrigerant 22 to an open flame or a very hot surface will cause a chemical reaction in the gas to form carbonyl chloride (phosgene), a highly toxic and corrosive gas. In its natural state, refrigerant 22 is a colorless odorless vapor with no toxic characteristics. It is lighter than air and in a well ventilated area will disperse rapidly. However, in an unventilated area it presents danger as a suffocant.

WARNING

Be sure the refrigeration system is fully discharged and purged and that dry nitrogen is flowing through the system at the rate of less than 1 - 2 cfm (0.028 - 0.057 m^3/minute) before all brazing or debrazing operations.

TECHNICAL MANUAL

TM 5-4120-359-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 25 February 1982

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL FOR AIR CONDITIONER, SPLIT PACKAGE, 18,000 BTU/HR COOLING 30,000 BTU/HR HEATING 208 VOLT, 3 PHASE, 400 HERTZ

KECO MODEL F18H4-2
4120-01-069-1321

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U. S. Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MPSD, 4300 Goodfellow Boulevard, St. Louis, MO 63120. A reply will be furnished directly to you.

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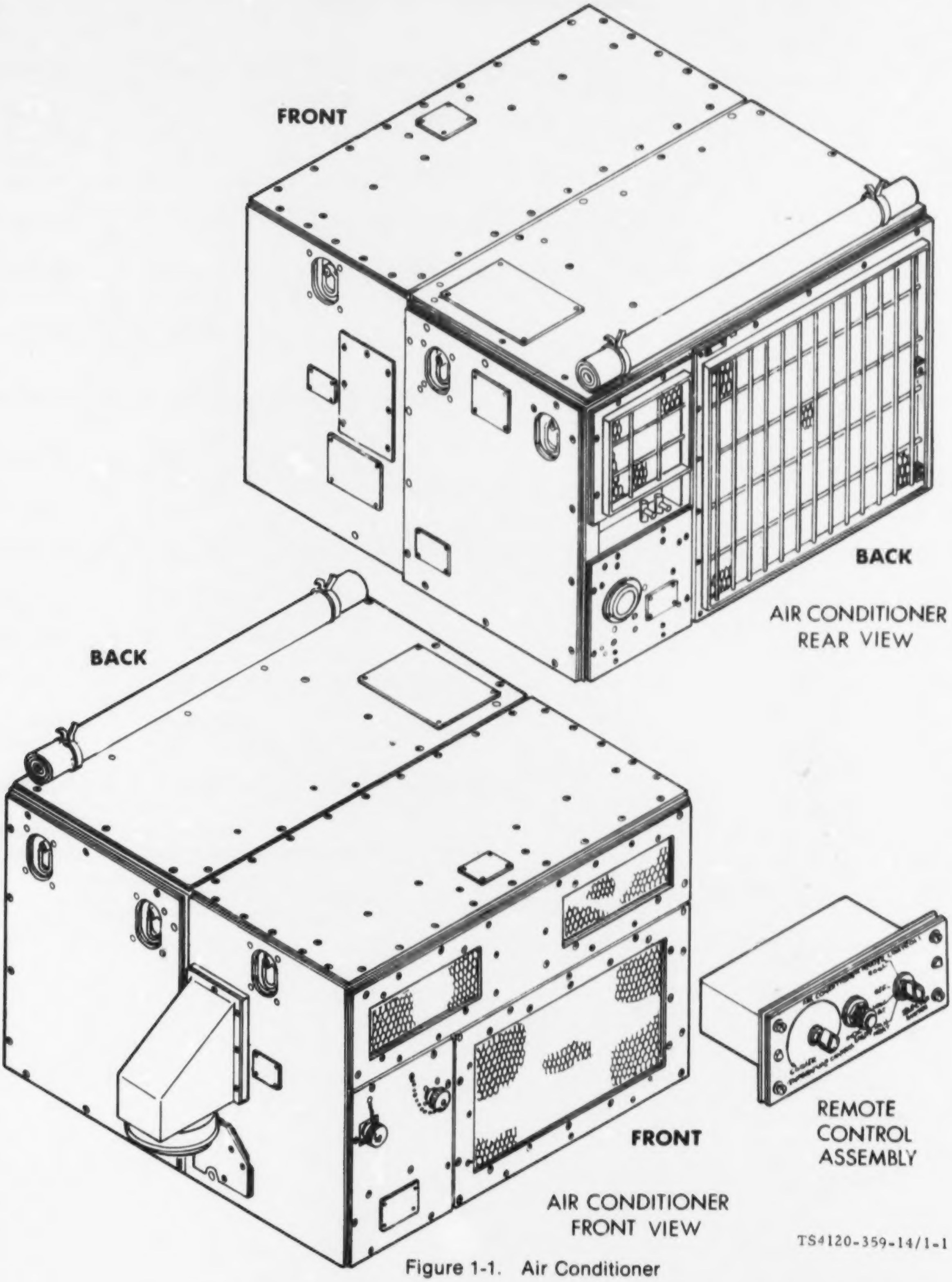

Figure 1-1. Air Conditioner

CHAPTER 1

INTRODUCTION

Section I GENERAL INFORMATION

1-1. SCOPE

a. Type of Manual. Operator's. Organizational. Direct Support, and General Support Maintenance Manual.

b. Model Number and Equipment Name. Keco Model F18H4-2, Split Package, 18,000 BTU/HR Cooling, 30,000 BTU/HR Heating, 208 Volt, 3 Phase, 400 Hertz, Air Conditioner.

c. Purpose of Equipment. Cools, heats, and ventilates enclosed space (shelter). The unit covered by this manual is designed for cooling and heating air to a desired predetermined range and circulating the conditioned air to provide heating and cooling of equipment or personnel within the conditioned area.

1-2. MAINTENANCE FORMS AND RECORDS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750. The Army Maintenance Management System (TAMMS).

1-3. HAND RECEIPT MANUAL

This manual has a companion document with a TM number followed by -HR (which stands for Hand Receipt). The TM5-4120-359-14-HR consists of preprinted hand receipts (DA Form 2062) that list end item related equipment (i.e., COEI, BII, and AAL) you must account for. As an aid to property accountability, additional -HR manuals may be requisitioned from the following source in accordance with procedures in Chapter 3, AR 310-2:

The US Army Adjutant General Publications Center
ATTN: AGLD-OD
2800 Eastern Blvd
Baltimore, Md 21220

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs)

If your Air Conditioner needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on a SF 368 (Quality Deficiency Report). Mail it to us at Commander, Headquarters, U.S. Army Troop Support and Aviation Materiel Readiness Command, Attention: DRSTS-MEM, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120. We will send you a reply.

1-5. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Command decisions, according to tactical situation, will determine when destruction of the air conditioning unit will be accomplished. A destruction plan will be prepared by the using organization, unless one has been prepared by higher authority. For general destruction procedures for this equipment, refer to TM 750-244-3, Procedures for Destruction of Equipment to Prevent Enemy Use.

1-6. PREPARATION FOR STORAGE OR SHIPMENT

Contact organizational maintenance for air conditioning unit preparation for storage or shipment. (See para 3-31.)

Section II EQUIPMENT DESCRIPTION

1-7. PURPOSE, CAPABILITIES AND FEATURES

a. Major Air Conditioner Components.

(1) Remote Control Assembly

(2) Evaporator Assembly

(3) Condenser Assembly

NOTE

The power cable assembly and the remote control cable assemblies are not provided as part of the air conditioner. See installation instructions contained in Chapter 3 of this manual, for general instructions and the manual for shelter on which air conditioner is to be installed for specific instructions pertaining to these cables.

b. The Model F18H4-2 Air Conditioner is designed to circulate and cool or heat air in the shelter or enclosure on which it is installed.

c. The Model F18H4-2 has a capability of providing 18,000 BTU/HR of cooling and two stages of heat rated at 18,000 BTU/HR (Low) and 30,000 BTU/HR (High). It is designed to maintain the air in the shelter or enclosure at the desired temperature selected on the remote control assembly.

d. The unit is a split package air conditioner that is ideally suited for van or shelter type installations. The only external requirements are a source of 208 volt ac, 3 phase, 400 hertz input power, power cable, remote control cables, and an entry to a suitable drain, lower than the base of the evaporator section cabinet in its operating location, for disposal of condensate waste water. It is designed to operate in almost any environmental condition from arctic to tropic and is fully portable for movement from one location to another.

e. The installation requirements are covered in the installation instructions contained in Chapter 3, "Organizational Maintenance Instructions."

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

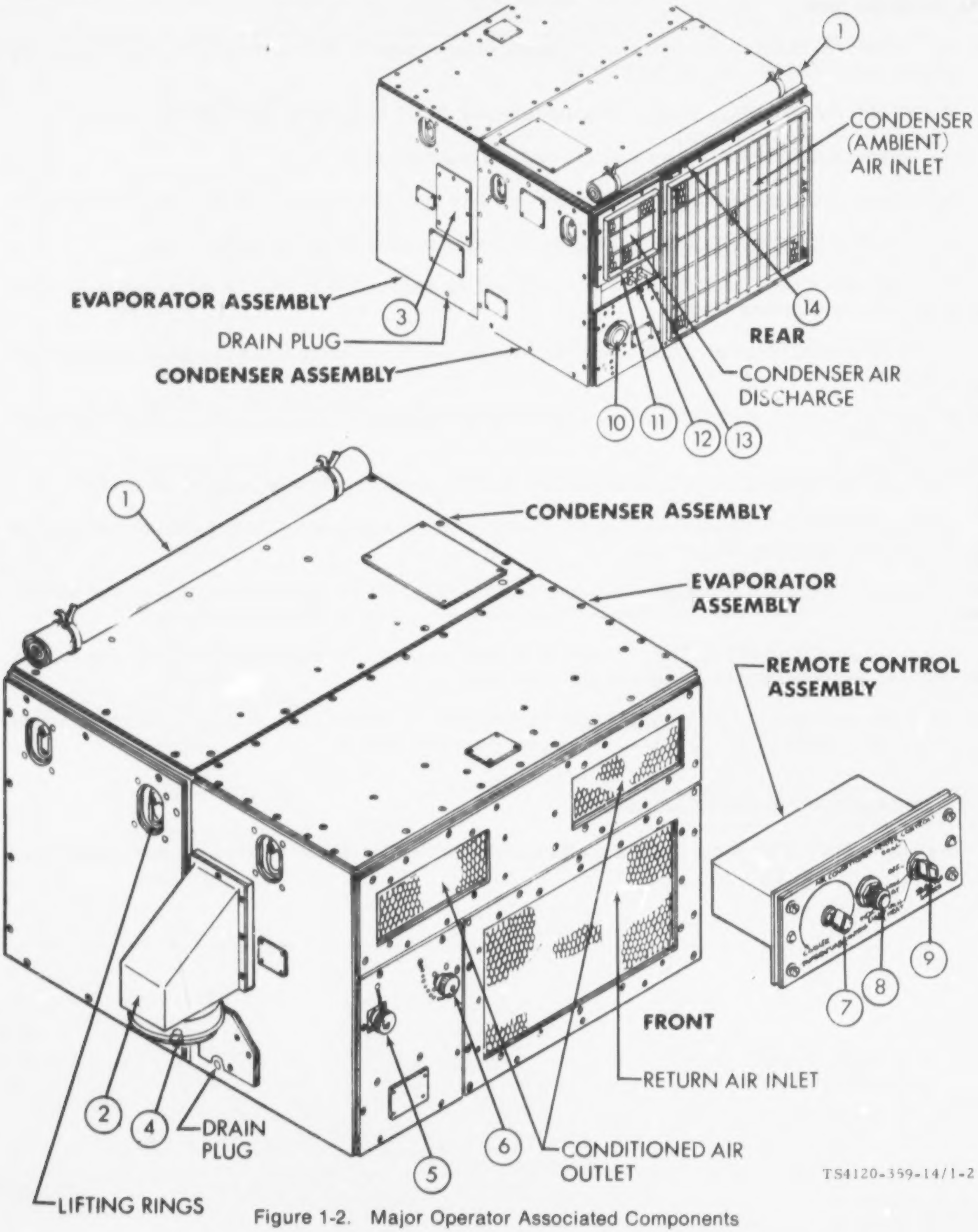

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Figure 1-2. Major Operator Associated Components

(1) CONDENSER COVER — Shown in stowed (operational) position. When rolled down and snapped (for shipment, non-operational travel and storage), it protects the grilles, meter, valves, sight glass and high pressure switch reset.

(2) FRESH AIR DUCT — Provides filtered outside air for ventilation. May be mounted on opposite side by exchanging it with FRESH AIR COVER, item 3.

(3) FRESH AIR COVER — Seals alternate FRESH AIR DUCT opening closed. See item 2 above.

(4) FRESH AIR FILTER — Filters the fresh (outside make up) air.

(5) POWER CONNECTOR (J1) — Connection point for input 208 volt, 3 phase, 400 Hz power cable.

(6) REMOTE CONTROL CONNECTOR (J7) — Connection point for remote control cable.

(7) TEMPERATURE CONTROL (A1-R1) — Allows adjustment and control of the temperature when operating in the cool or heat modes.

(8) RUN INDICATOR LIGHT (XDS1) — Lights when the unit is operating. Also lights when pressed in (for test purposes) if power is connected.

(9) MODE SELECTOR SWITCH (S1) — Allows operator to select COOL, OFF, LOW HEAT or HIGH HEAT operating mode.

(10) TIME TOTALIZING (HOUR) METER (M1) — Indicates operating time (elapsed) in all modes.

(11) SIGHT GLASS — Allows visual inspection and indicates the condition of the liquid refrigerant when the unit is operating in the COOL mode.

(12) LOW SIDE SERVICE VALVE — Provides a connection point for maintenance, testing, and service. Unauthorized personnel should not tamper with this valve.

(13) HIGH SIDE SERVICE VALVE — Provides a connection point for maintenance, testing, and service. Unauthorized personnel should not tamper with this valve.

(14) HIGH PRESSURE CUTOUT (SWITCH) RESET (S4) — Permits manual closing (reset) of switch following system shutdown due to excessive refrigerant system pressure.

1-9. DIFFERENCES BETWEEN MODELS

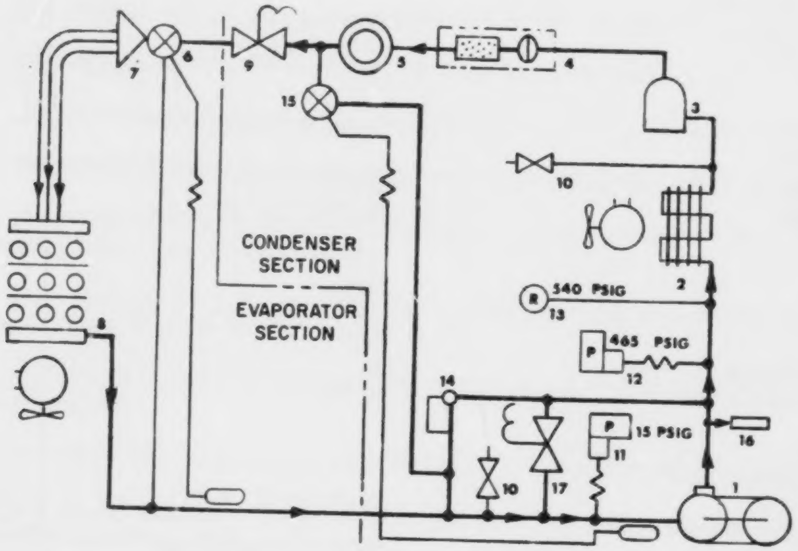
There are no model differences in effect on the Keco Industries, Inc. Model F18H4-2 Air Conditioner unit.

1-10. EQUIPMENT DATA

OPERATING TEMPERATURES	
LOW (IN HEAT MODE)	-50°F (-45°C)
HIGH (IN COOL MODE)	+125°F (+51.7°C)
PERFORMANCE	
COOLING CAPACITY	18,000 BTU/HR
HEATING CAPACITY	
LOW HEAT MODE	18,000 BTU/HR
HIGH HEAT MODE	30,000 BTU/HR
POWER REQUIRED	
VOLTAGE	208
PHASE	3
HERTZ	400
AMPERES, EACH PHASE	28
WATTS, RUNNING (MAXIMUM)	10,000
DIMENSIONS	
EVAPORATOR SECTION	
WIDTH (UNIT ONLY)	32.25 in. (81.92 cm)
WIDTH (INCLUDING FRESH AIR DUCT)	39.93 in. (101.42 cm)
DEPTH	15.09 in. (38.33 cm)
HEIGHT	22.09 in. (56.11 cm)
CONDENSER SECTION	
WIDTH	32.25 in. (81.92 cm)
DEPTH	18.62 in. (47.29 cm)
HEIGHT	22.12 in. (56.19 cm)
REMOTE CONTROL	
WIDTH	8.25 in. (20.96 cm)
DEPTH	5.65 in. (14.35 cm)
HEIGHT	3.50 in. (8.89 cm)
WEIGHT (TOTAL)	340 pounds (166.2 kg)
REFRIGERANT	
TYPE	R-22
CHARGE	6 pounds (2.93 kg)

Section III TECHNICAL PRINCIPLES OF OPERATION

1-11. REFRIGERATION CYCLE See figure 1-3.



COMPONENT REFERENCE LIST	
FIND NO.	DESCRIPTION
1	COMPRESSOR
2	CONDENSER COIL
3	RECEIVER
4	DEHYDRATOR
5	LIQUID INDICATOR
6	EXPANSION VALVE
7	DISTRIBUTOR
8	EVAPORATOR COIL
9	SOLENOID VALVE
10	SERVICE VALVE
11	PRESSURE SWITCH (LOW)
12	PRESSURE SWITCH (HIGH)
13	PRESSURE RELIEF VALVE
14	DISCHARGE BYPASS VALVE
15	EXPANSION VALVE
16	LINEAR ACTUATING CYL
17	SOLENOID VALVE

TS4120-359-14/1-3

Figure 1-3. Refrigeration Schematic

a. Cooling Cycle — When the MODE SELECTOR SWITCH and the TEMPERATURE CONTROL are set for COOLER the following takes place:

- The compressor (1) takes cold, low pressure refrigerant gas and compresses it to a high temperature, high pressure gas. This gas flows through the metal tubing to the condenser coil (2) and receiver (3).

- The condenser fan draws outside ambient air over and through the condenser coil (2). The high temperature, high pressure gas from the compressor (1) is cooled by the flow of air and is changed into a high pressure liquid.

- The refrigerant desiccant dehydrator (filter drier) (4) removes any moisture (water vapor) or dirt that may be carried by the liquid refrigerant.

- The liquid indicator (sight glass) (5) indicates the presence of moisture and quanitity of refrigerant in the system.

- The solenoid valve (9) is controlled by the temperature selector on the control panel. This valve will shut off the flow of refrigerant to the evaporator section when the temperature in the conditioned area reaches the set point.

- The expansion valve (6) controls the amount and pressure of liquid refrigerant to the evaporator coil (8). The expansion valve (6) senses the temperature and pressure of the refrigerant as it leaves the evaporator coil. By use of a sensing bulb and "external equalizer line" the valve constantly adjusts the flow of liquid refrigerant to the evaporator coil (8).

- As the liquid refrigerant leaves the expansion valve (6) it passes thru the distributor (7) and enters the evaporator coil (8). As the liquid enters the coil at a reduced pressure, the reduction in pressure and the warmer air being forced across the tubes of the coil cause the refrigerant to boil and change to a gas (vapor). The evaporator blower circulates the warm air from the conditioned space over and through the evaporator coil. Refrigerant absorbs heat when it changes from a liquid to a gas. As the air from the conditioned spaces comes in contact with evaporator coil (8), the air is cooled.

- To prevent compressor overload and damage during startup, solenoid valve (17) is open at start of cooling cycle to equalize pressure on both sides of the compressor.

b. Bypass Cycle. This unit has a bypass cycle which allows cooling operation at low cooling loads without cycling the compressor on and off. In bypass, the refrigerant is piped from the discharge (high side) to the suction (low side) of the compressor, bypassing the evaporator coil (8).

- When the temperature selector on the control panel senses that cooling conditions have reached the set point, it closes the solenoid valve (9) to shut off refrigerant flow to the evaporator coil (8).

- As the compressor suction pressure starts to drop, the discharge bypass valve (14) opens to allow flow of hot gas from the compressor.

- The liquid quench expansion valve (15) senses the temperature of the gas at the suction side of the compressor. To prevent excessively hot gas from reaching the compressor, the liquid quench expansion valve (15) opens to allow liquid refrigerant to mix with the hot gas.

- The linear actuating cylinder assembly (16) automatically controls the condenser discharge louver assembly to maintain an adequate discharge pressure.

- The service valves (10) are provided for charging, and general servicing of the high and low pressure sides of the refrigerant system.

- The low pressure switch (11), the high pressure switch (12) and the pressure relief valve (13) are provided to protect the unit from damage due to pressure extremes.

1-12. HEATING

When the MODE SELECTOR SWITCH is set for HIGH HEAT, heating elements, located behind the evaporator coil, are energized. These elements are protected from overheating by a thermal cutout switch. Nine of the elements are thermostatically controlled by the TEMPERATURE CONTROL, and remaining six are on all of the time. When set for LOW HEAT, only the thermostatically controlled elements are energized.

CHAPTER 2

OPERATING INSTRUCTIONS

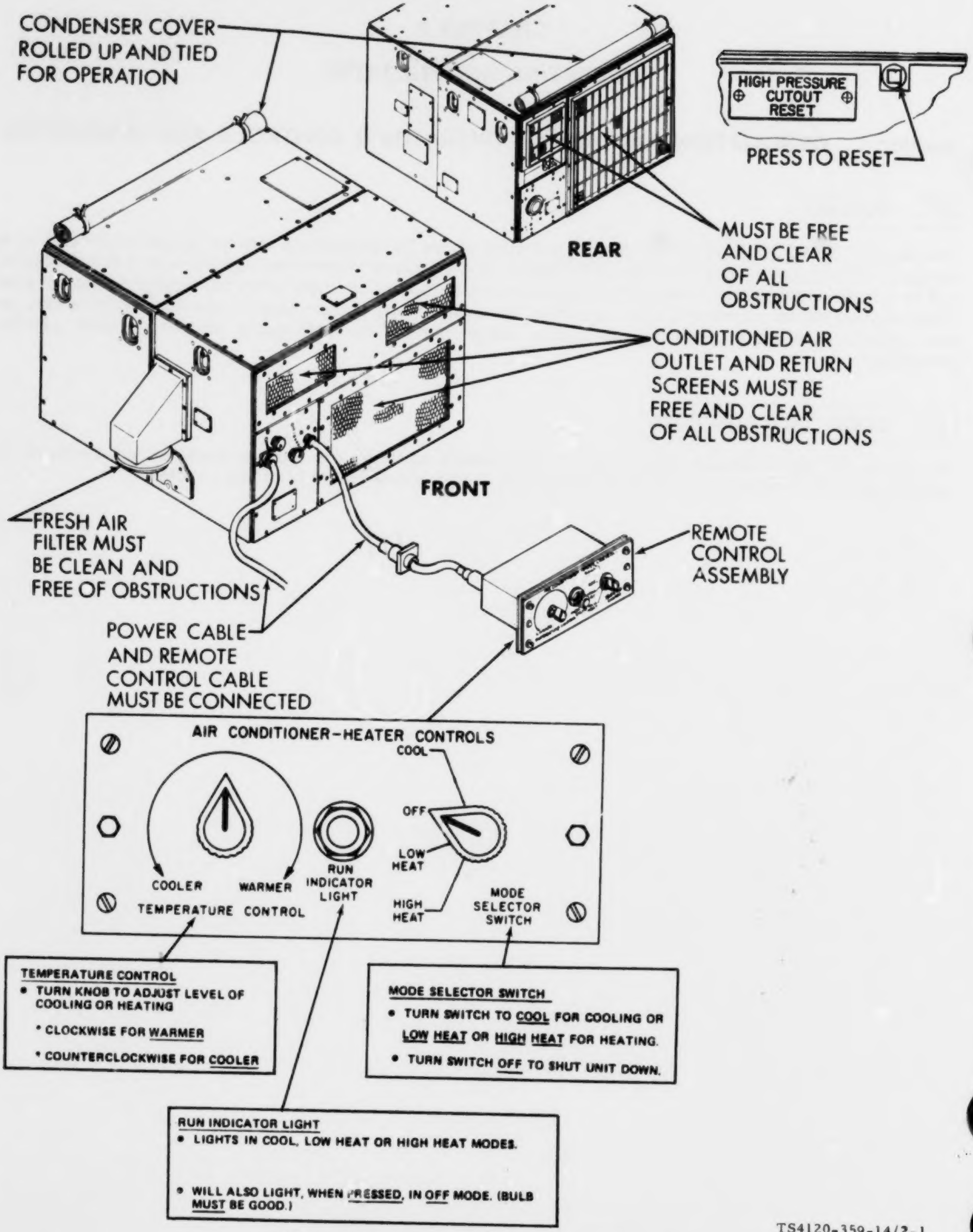
Section I DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. GENERAL

The Model F18H4-2 Air Conditioner is designed for a variety of installations and for operation under a wide range of climatic conditions. it is also designed for continuous or intermittent operation as a self-contained unit or may be connected to external filtering equipment for operation under chemical-biological-radiological (CBR) environmental conditions. Operators must be aware of any peculiarities or operational limitations for their specific installation. See the appropriate shelter manual for instructions peculiar to your specific installation.

2-2. OPERATOR'S CONTROLS

See figure 2-1 for a general description of the checks and controls that an operator will normally be concerned with. For specific operating instructions, see Sections III and IV of this chapter.



CONDENSER COVER ROLLED UP AND TIED FOR OPERATION

PRESS TO RESET

MUST BE FREE AND CLEAR OF ALL OBSTRUCTIONS

CONDITIONED AIR OUTLET AND RETURN SCREENS MUST BE FREE AND CLEAR OF ALL OBSTRUCTIONS

FRESH AIR FILTER MUST BE CLEAN AND FREE OF OBSTRUCTIONS

REMOTE CONTROL ASSEMBLY

POWER CABLE AND REMOTE CONTROL CABLE MUST BE CONNECTED

TEMPERATURE CONTROL
- TURN KNOB TO ADJUST LEVEL OF COOLING OR HEATING
  - CLOCKWISE FOR WARMER
  - COUNTERCLOCKWISE FOR COOLER

MODE SELECTOR SWITCH
- TURN SWITCH TO COOL FOR COOLING OR LOW HEAT OR HIGH HEAT FOR HEATING.
- TURN SWITCH OFF TO SHUT UNIT DOWN.

RUN INDICATOR LIGHT
- LIGHTS IN COOL, LOW HEAT OR HIGH HEAT MODES.
- WILL ALSO LIGHT, WHEN PRESSED, IN OFF MODE. (BULB MUST BE GOOD.)

TS4120-359-14/2-1

Figure 2-1. Operator's Controls and Checks

2-3. INDICATORS

a. The run indicator light (fig. 2-1), the time totalizing meter, and the refrigerant sight glass are the only visual indicators incorporated in the Model F18H4-2 Air Conditioner.

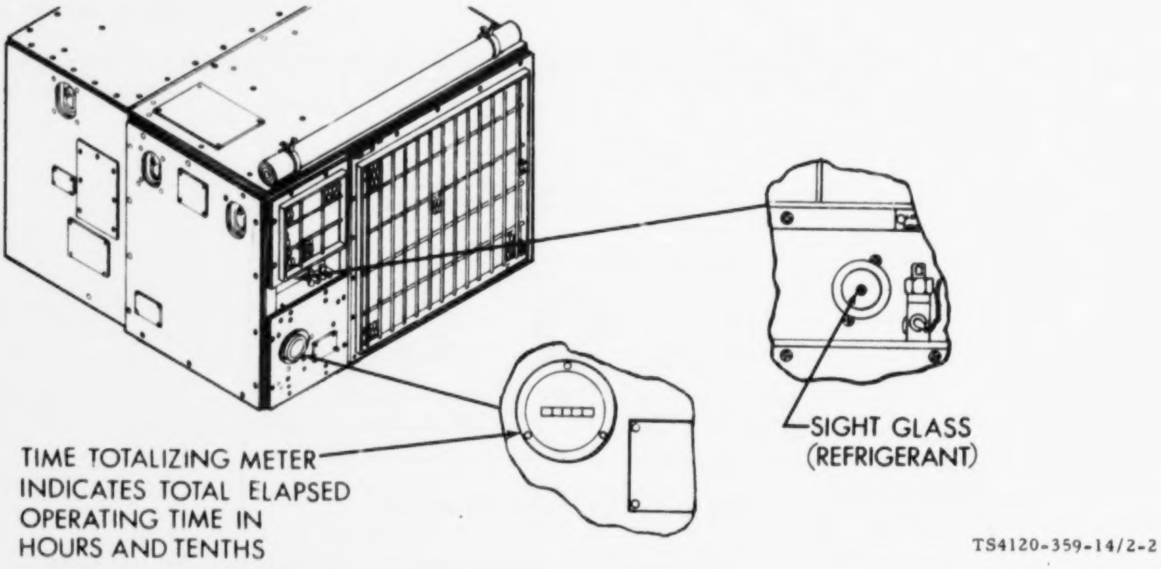

TIME TOTALIZING METER INDICATES TOTAL ELAPSED OPERATING TIME IN HOURS AND TENTHS
SIGHT GLASS (REFRIGERANT)
TS4120-359-14/2-2

Figure 2-2. Visual Indicators

(1) The time totalizing meter is used to determine maintenance intervals.

(2) The sight glass is a port or window through which the refrigerant condition can be seen. Liquid refrigerant actually flows through the sight glass chamber only during cooling cycles when the air conditioner is in operation in the COOL mode. The sight glass is equipped with a center indicator that is moisture sensitive. Dry refrigerant is indicated by green, it turns to chartreuse when the moisture content becomes undesirable, and to yellow when the level becomes unacceptable. Excessive moisture in the refrigerant may damage or possibly destroy the compressor. If the liquid refrigerant observed in the sight glass has an opaque, milky appearance, or frequent bubbles appear, the volume of refrigerant is low and the system should be charged. Either moisture or low charge indications should be reported to direct support maintenance.

CAUTION

Do not operate the air conditioner in the COOL mode if the refrigerant color has reached the yellow band or if numerous bubbles appear in the sight glass. COOL mode operation may be continued with the refrigerant color in the chartreuse band or with only an occasional bubble appearing in the window, but the sight glass should be rechecked after each four hours of operation to insure that the condition has not become worse.

Section II OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

The operator is not required to perform preventive maintenance checks and services. Maintenance by operator/crew is limited to operating the air conditioner in COOL, LOW HEAT and HIGH HEAT modes. Refer *any* malfunction to organizational maintenance.

Section III OPERATION UNDER USUAL CONDITIONS

The operator/crew is limited to operating the air conditioner in COOL, LOW HEAT, and HIGH HEAT modes. For assembly and preparation for use, operational checks and preparation for movement refer to organizational maintenance.

2-4. GENERAL OPERATING PROCEDURES

a. Before operation

(1) Check to see that power is connected to the unit by pressing the RUN INDICATOR LIGHT. It should light when pressed in.

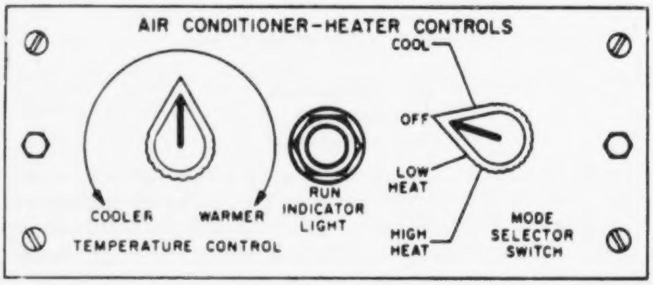


Figure 2-3. Run Indicator Light

(2) When the military operational situation permits, it is good practice to have power connected to the unit at least six hours before operating in the COOL mode. This allows the crankcase heater to raise the compressor oil temperature to the normal operating temperature. This will help to extend the compressor life. In cases where military operational requirements demand, the unit may be turned on to the COOL mode immediately after connection of power; however, the more warm-up time that can be allowed during the off cycle the better it will be for the compressor.

CAUTION

If there is a loud banging noise coming from the condenser section when the unit is operated in the COOL mode, immediately turn the MODE SELECTOR SWITCH to OFF. Allow at least one hour of warm up time before attempting a restart in the COOL mode.

(3) Check that condenser cover is rolled up and securely tied.

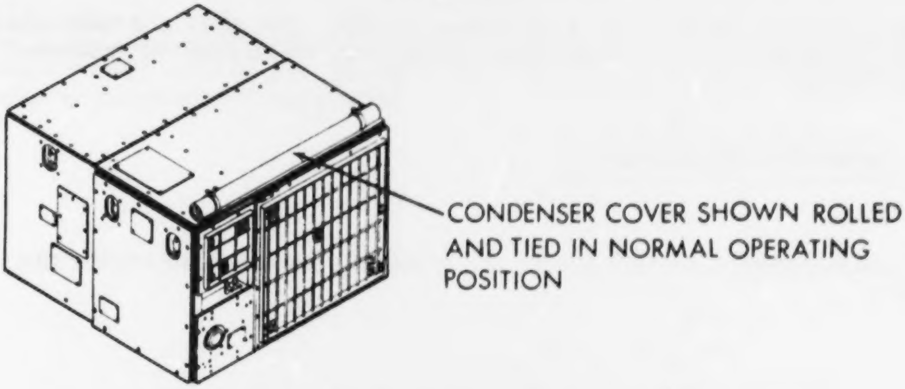

CONDENSER COVER SHOWN ROLLED AND TIED IN NORMAL OPERATING POSITION

Figure 2-4. Condenser Cover

CAUTION

Under normal operating conditions, before starting the air conditioner in any mode, make sure that the fabric condenser cover on the back of the condenser section is rolled up and secured, and that all screens and guards are in place and unobstructed. EXCEPTIONS: Under extreme cold climatic conditions, such as blowing snow, or freezing rain which might enter and damage condenser section, the unit may be operated in the LOW HEAT or HIGH HEAT mode with the fabric covered rolled down and snapped in place.

DO NOT OPERATE IN THE
COOL MODE WITH THE FABRIC
COVER ROLLED DOWN.

(4) Check that all air intake and discharge openings are clear.

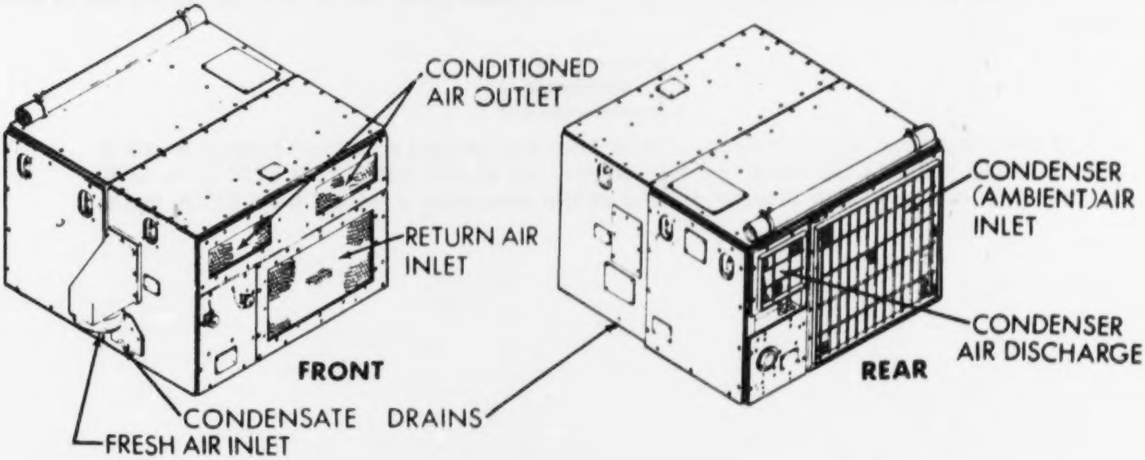


Figure 2-5. Intake and Discharge Openings and Drains

(5) Condensate drains must not be plugged. Assure that both drains are either open or piped to a satisfactory location with a proper drain system.

b. Operation in COOL mode.

(1) Turn MODE SELECTOR SWITCH to COOL. After 5 seconds, air flow can be felt at the conditioned air outlets inside the shelter.

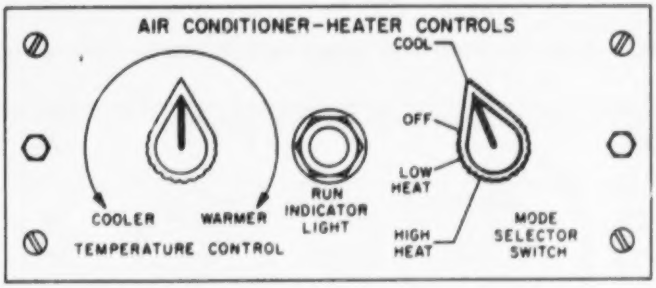


Figure 2-6. Operation in Cool Mode

TS4120-359-14/2-6

(2) Turn TEMPERATURE CONTROL to COOLER. After 2 minutes, air from conditioned air outlets inside the shelter will feel cooler than ambient air.

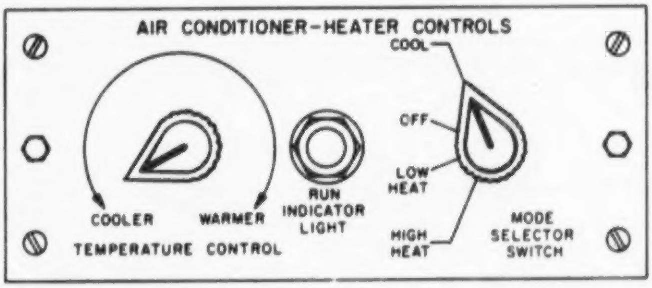


Figure 2-7. Adjustment — Cooler

TS4120-359-14/2-7

(3) When the room or shelter temperature drops to the desired level, *slowly* turn the TEMPERATURE CONTROL knob toward WARMER. Cooling will stop when you reach the approximate room temperature.

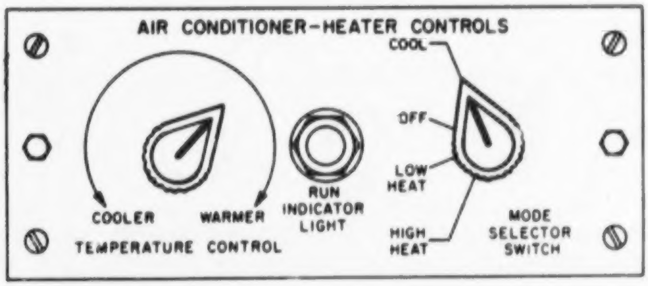


Figure 2-8. Adjustment — Warmer

TS4120-359-14/2-8

(4) Further adjustment can be made by turning the TEMPERATURE CONTROL knob slightly toward the WARMER or COOLER setting until a constant desired room or shelter temperature is maintained.

c. Operation in the LOW HEAT mode.

(1) Turn MODE SELECTOR SWITCH to LOW HEAT. After 5 seconds, air flow can be felt.

NOTE

In the LOW HEAT mode the condenser (rear) section blower does not operate.

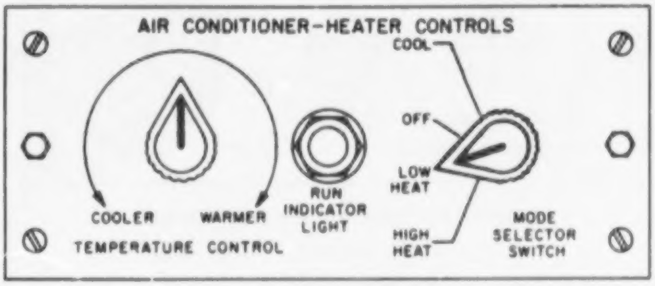


Figure 2-9. Operation in Low Heat Mode. TS4120-359-14/2-9

(2) Turn TEMPERATURE CONTROL knob to WARMER. After 2 minutes, air from conditioned air outlets will feel warmer than the ambient air.

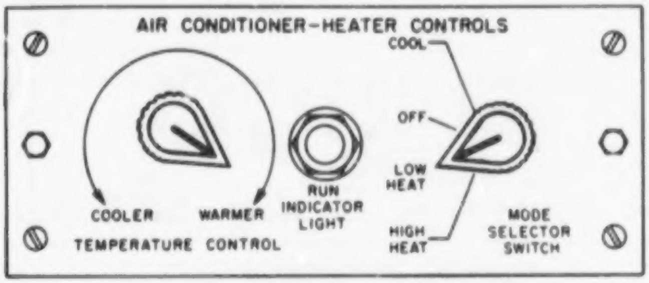


Figure 2-10. Adjustment — Warmer TS4120-359-14/2-10

(3) When the room or shelter air temperature rises to the desired level, *slowly* turn the TEMPERATURE CONTROL knob toward COOLER. Heating will stop when you reach the approximate room temperature.

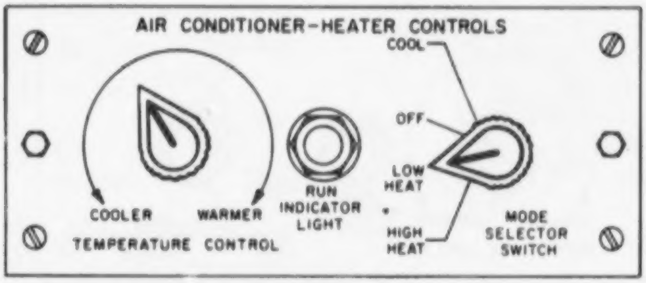


Figure 2-11. Adjustment — Cooler TS4120-359-14/2-11

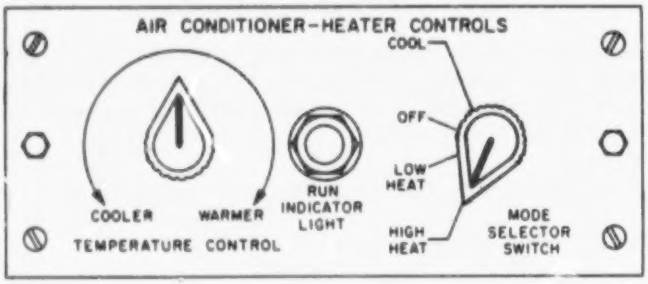
(4) Further adjustment can be made by turning the TEMPERATURE CONTROL knob slightly toward the WARMER or COOLER setting until a constant desired room or shelter temperature is maintained.

d. Operation in the HIGH HEAT mode. Use HIGH HEAT mode when LOW HEAT mode fails to heat room or shelter, or for faster warm up after a period of shutdown.

(1) Turn MODE SELECTOR SWITCH to HIGH HEAT. After 5 seconds, air flow can be felt.

NOTE

In the HIGH HEAT mode the condenser (rear) section blower does not operate.



TS4120-359-14/2-12

Figure 2-12. Operation in High Heat Mode

(2) Turn TEMPERATURE CONTROL knob to WARMER. After 2 minutes, air from conditioned air outlets will feel warmer than the ambient air.

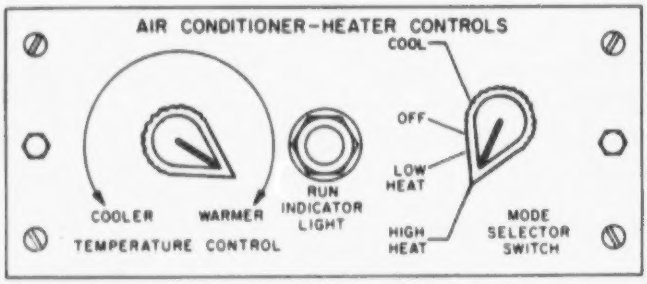


Figure 2-13. Adjustment — Warmer

TS4120-359-14/2-13

(3) When the room or shelter air temperature rises to the desired level, *slowly* turn the TEMPERATURE CONTROL knob toward COOLER.

NOTE

During HIGH HEAT mode operation, one bank of heating elements operate continuously. The TEMPERATURE CONTROL will control (turn on or off automatically) a second bank of heaters.

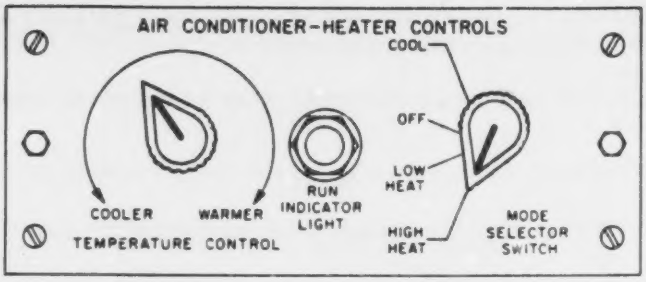


Figure 2-14. Adjustment — Cooler

(4) Further adjustment can be made by turning the TEMPERATURE CONTROL knob slightly toward the WARMER or COOLER setting until a constant desired room or shelter temperature is maintained. Should temperature continue to rise with the temperature control adjusted to the extreme COOLER setting, turn MODE SELECTOR SWITCH to the LOW HEAT position.

e. Operating the unit for ventilation only. (No heating or cooling desired.)

(1) Turn the MODE SELECTOR SWITCH to the LOW HEAT position.

(2) Turn the TEMPERATURE CONTROL as far as it will go toward the COOLER position.

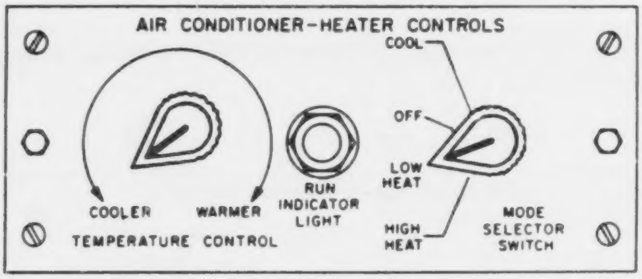


Figure 2-15. Ventilation Only

f. Shutdown.

(1) Turn the MODE SELECTOR SWITCH to OFF.

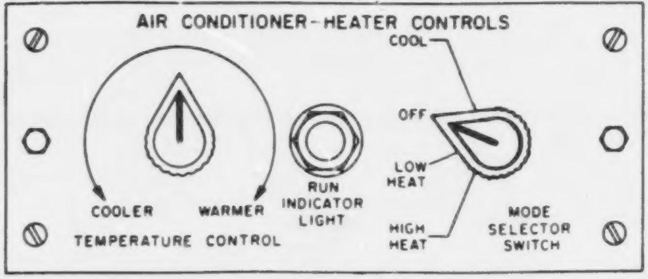


Figure 2-16 Shutdown (OFF)

NOTE

Military operational considerations permitting, power should be maintained to the air conditioner during periods or normal shut down and should be disconnected or turned off only if the unit is to be serviced or during periods of extended shutdown. (See paragraph 2.4.a.(2), page 2-5).

2-5. INFORMATION PLATES

A number of instruction, warning and identification plates are provided with the unit. See figure 2-17 for the external plates.

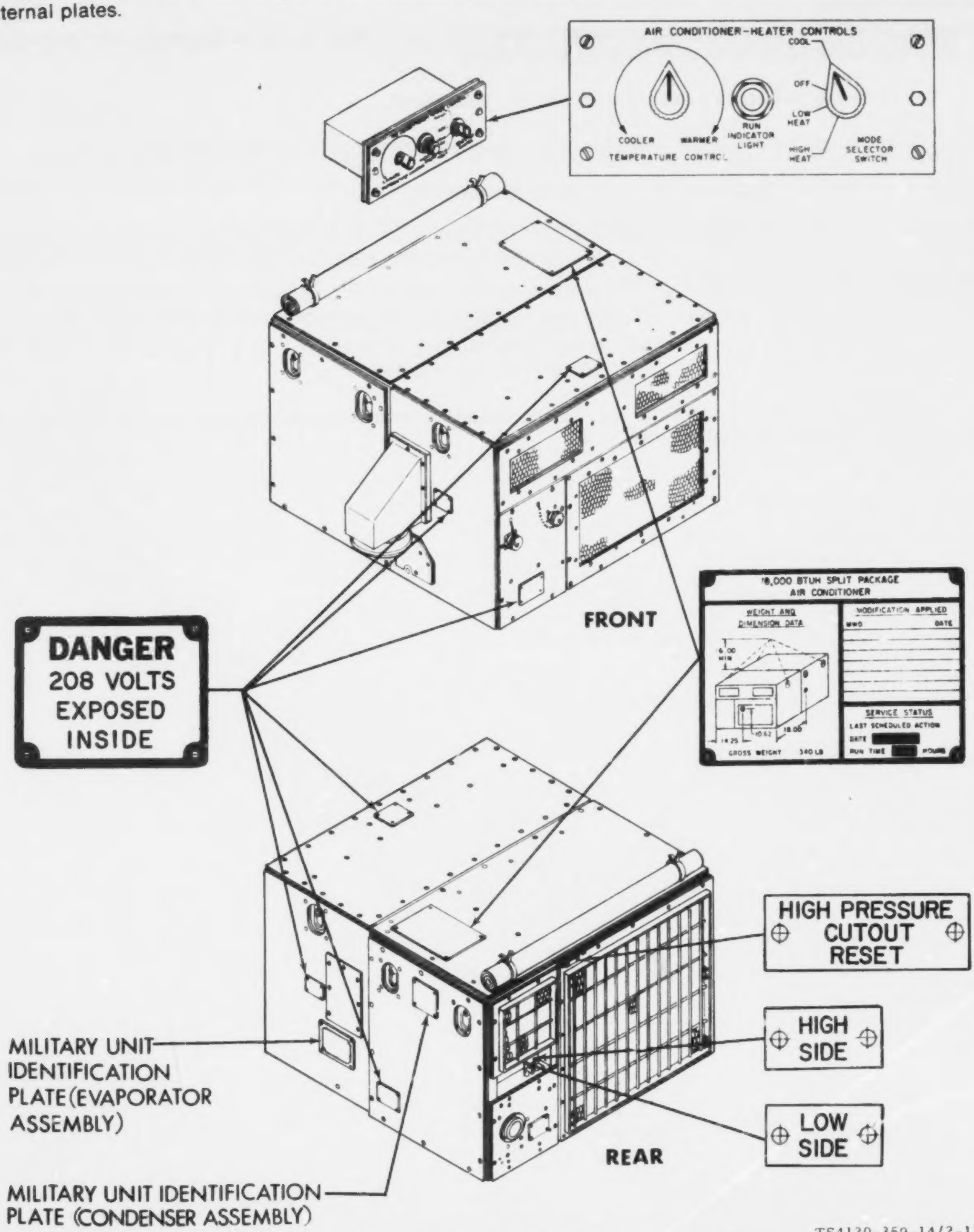


Figure 2-17. Instruction, Warning and Identification Plates

Section IV OPERATION UNDER UNUSUAL CONDITIONS

2-8. GENERAL

There are no special instructions for operation under unusual conditions. The operator should, however, be aware of the following general practice type suggestions.

a. The following will apply to all extreme weather conditions.

(1) Keep all doors and other openings in the room or shelter tightly closed when not in use.

(2) Limit traffic in and out of doors as much as possible.

b. Under extreme cold climatic conditions, such as blowing snow, or freezing rain which might enter and damage condenser section, the unit may be operated in the LOW HEAT or HIGH HEAT mode with the fabric cover rolled down and snapped in place.

DO NOT OPERATE IN THE
COOL MODE WITH THE FABRIC
COVER ROLLED DOWN.

c. Frequency of maintenance must also be increased for most extreme weather conditions. This is the responsibility of organizational maintenance.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

3-1. GENERAL

a. Repair parts are listed and illustrated in TM 5-4120-359-24P. No special tools are required for maintenance of the equipment.

b. For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

c. No special tools are required for organizational maintenance of this equipment. All common hand tools required by organizational maintenance can be found in the Tool Kit, Service, Refrigeration Unit, NSN 5180-00-597-1474.

Section II SERVICE UPON RECEIPT OF EQUIPMENT

3-2. UNLOADING

The model F18H4-2 Air Conditioner is packaged in a container designed for shipment and handling with the cabinet in an upright position. The base of the container is constructed as a shipping pallet with provisions for the insertion of the forks on materials handling equipment.

a. Remove all blocking and tiedowns that may have been used to secure the container to the carrier.

b. Use a forklift truck, overhead hoist, wrecker, or other suitable material handling equipment to remove the packaged unit from the carrier.

CAUTION

Use care in handling to avoid damage to the air conditioner. If an overhead lifting device must be used, use an appropriate sling so that the weight of the unit is borne by the base of the shipping container.

3-3. UNPACKING

a. General. Normally, the packaged air conditioner should be moved into the immediate area in which it is to be installed before it is unpacked.

NOTE

The shipping container and pallet are of such a design that they may be retained for reuse for mobility purposes if frequent relocation of the air conditioner is anticipated.

b. Remove Shipping Container. Remove all bands and retaining devices that secure the upper container to the base pallet. Lift the container vertically and remove it from the base pallet.

c. Remove Packaging. Remove the cushioning around the top of the cabinet and retain, if reuse is anticipated. Remove the preservation barrier, if applicable, by tearing around the bottom of the air conditioner cabinet. Remove the technical publications envelope and accessory sack that are taped to the cabinet, and put them in a safe place.

NOTE

It is recommended that the cabinet be left bolted to the shipping pallet until time to place it in the installation position. All receiving inspection actions can be conducted without removal from the pallet.

3-4. RECEIVING INSPECTION

Perform receiving inspection of the air conditioner in the following manner:

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report damage on DD Form 6, Packaging Improvement Report.

b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of TM 38-750 (The Army Maintenance Management System).

c. Check to see whether the equipment has been modified.

3-5. INSTALLATION SITE PREPARATION

If the air conditioner is to be used on a shelter or system that is specifically designed to accept the air conditioner, see the Technical Manual(s) for that shelter or system.

a. The following is a list of general guidelines for installation site preparation.

(1) A relatively level surface capable of bearing the weight of the air conditioner to insure proper condensate drainage. The surface should be level to within 10° from front to back and side to side. See figures 3-1, 3-2, and 3-3 for mounting dimensions.

(2) An unobstructed flow of air from outside the conditioned area to the ambient air inlet and discharge openings on the rear of the condenser assembly.

(3) An unobstructed flow of air to and from inside the conditioned area to the return air inlet and the two supply air outlets located on the front of the evaporator assembly.

NOTE

A return air filter is not provided as part of the air conditioner. It must be installed in duct work connected to the return air inlet.

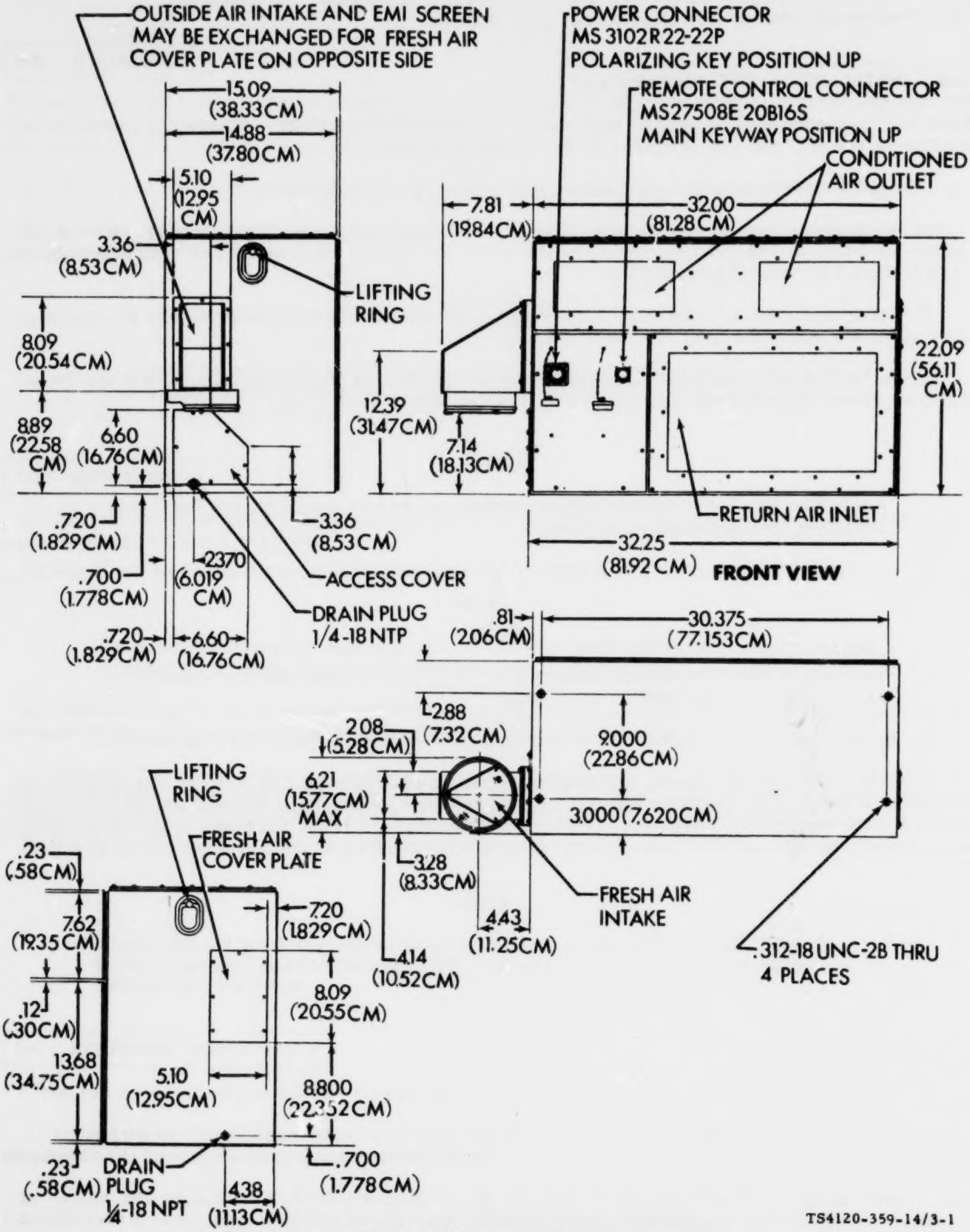
(4) An unobstructed flow of air from outside the conditioned area to the fresh air intake. See figure 3-1.

NOTE

The fresh air intake may be mounted on the left or right side of the evaporator assembly by exchanging it with the fresh air cover plate.

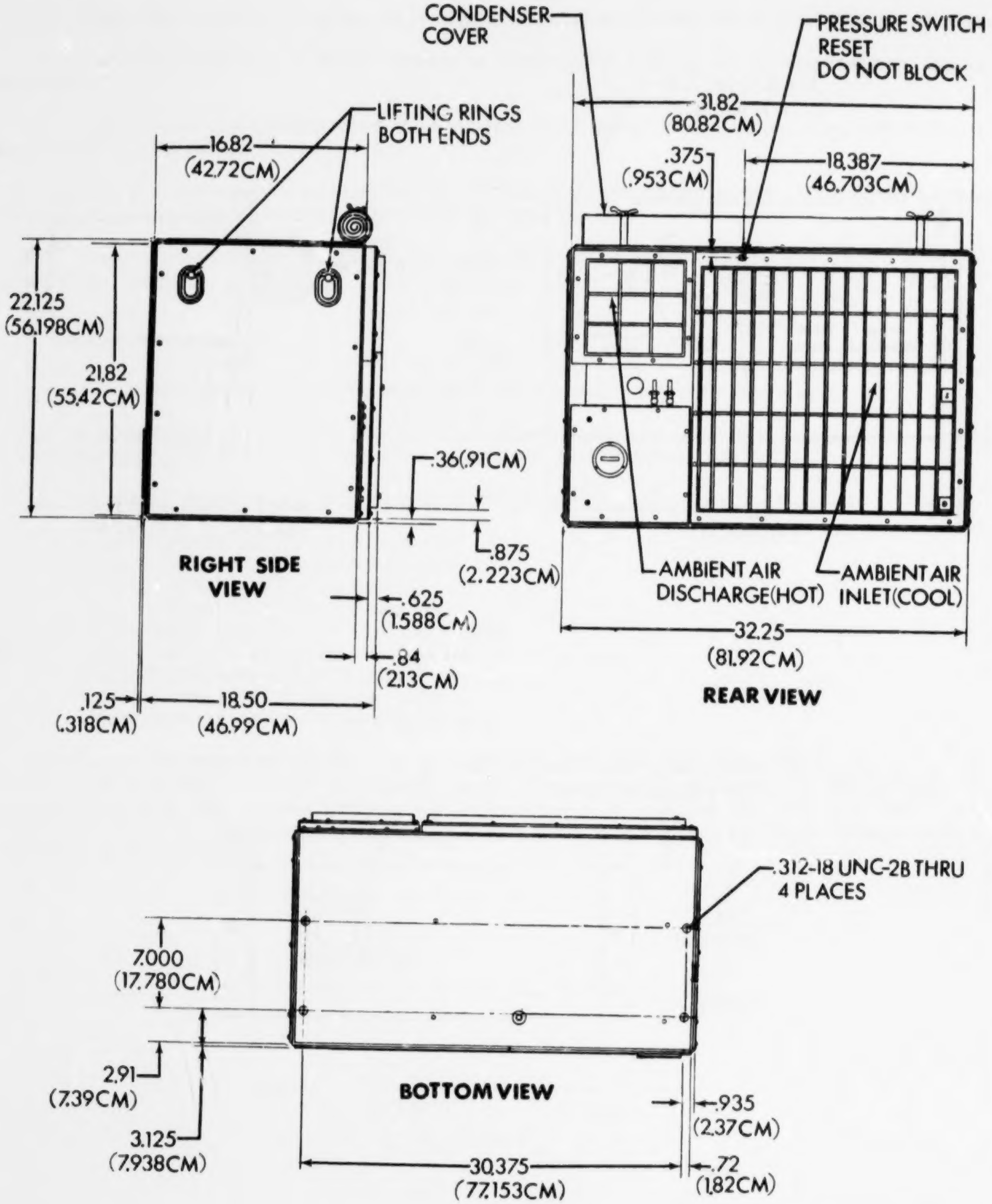
(5) Access to all removable outside covers should be considered for servicing internal parts.

(6) A source of 208 volt, 3 phase, 400 hertz input power rated at 28 amps. The power source outlet should be located as near as possible to the installed location of the air conditioner. The power source wiring must include a disconnect switch. However, provisions should be made to insure that power is not disconnected during normal operation and that the disconnect is not used to turn off the air conditioner for normal shutdown.



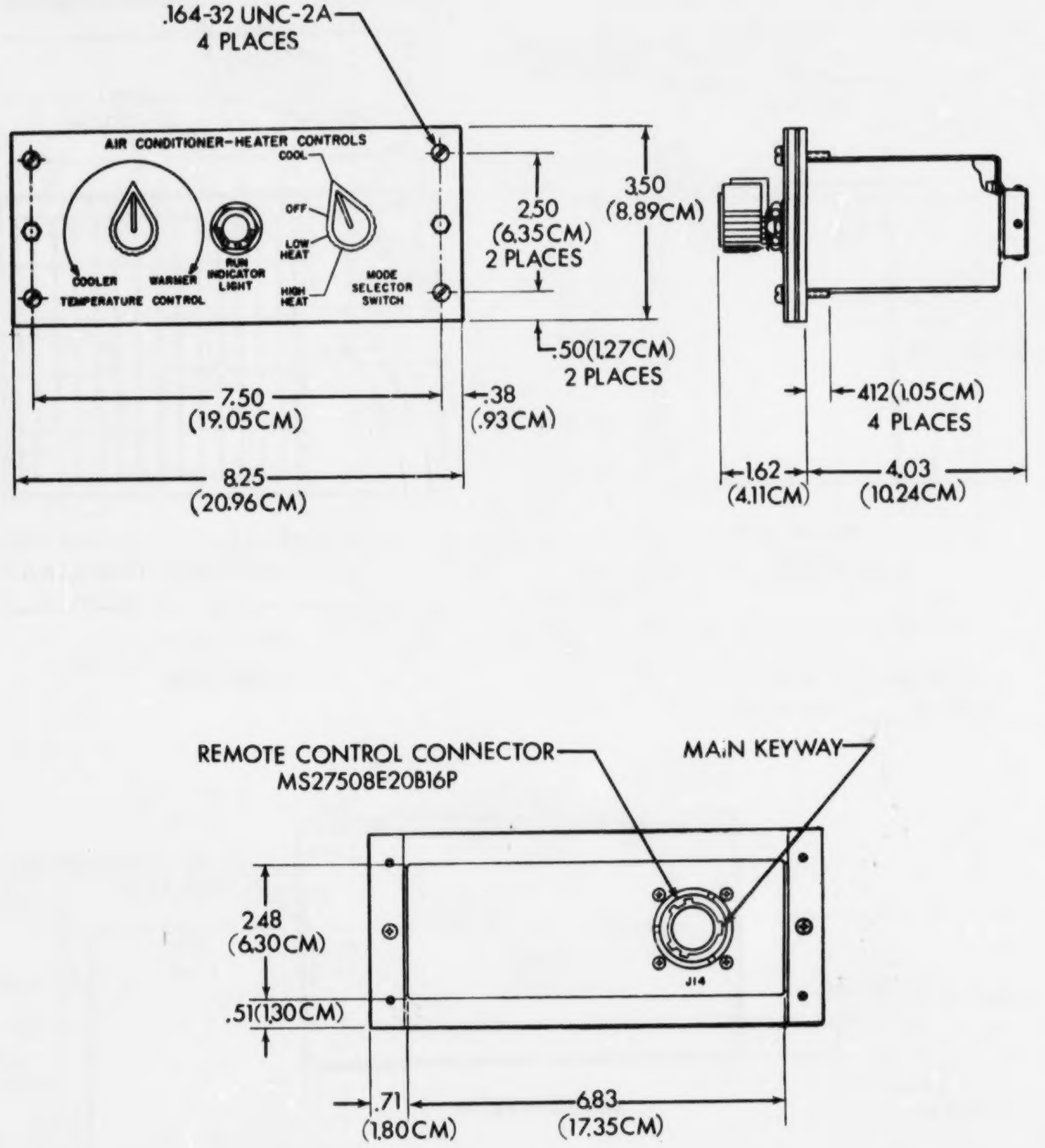
TS4120-359-14/3-1

Figure 3-1. Installation Dimensions, Evaporator Assembly



TS4120-359-14/3-2

Figure 3-2. Installation Dimensions, Condenser Assembly



TS4120-359-14/3-3

Figure 3-3. Installation Dimensions, Remote Control Assembly

(7) Check that no source of dangerous or objectionable fumes are near the fresh air intake.

(8) If possible make use of terrain features to minimize the heating and cooling loads on the air conditioner.

(9) If possible avoid a location where the condenser and fresh air intakes will be laden with dust, dirt, soot, smoke or other debris.

b. The following items are not provided as part of the air conditioner. They are part of the shelter and are necessary for air conditioner installation and operation. (See fig. 3-4.)

(1) One or more remote control cables. Use (18876) 11455976-1, 11455976-2, 11455977-1, or 61455977-2 cables as applicable.

NOTE

A part number 11455976-1 or -2 cable must be used if only one cable is used.

(2) A power input cable with a plug on the air conditioner end suitable for attachment to a MS 3102R22-22P connector. The Patriot installation uses (18876) 11453295 power cable.

(3) Installation hardware and grounding strap. The Patriot installation uses the following:

8 each (18876) 11447172-1 Flat washers
16 each (18876) 11447981 Resilient mounts
16 each (18876) 11447173 Flat washers
8 each (18876) 11447172-2 Flat washers
8 each (96906) MS35307-338 Hex head screws
4 each (18876) 11455133 Grounding straps
4 each (96906) MS51958-97 Screws
4 each (96906) MS35335-62 Lock washers
4 each (96906) MS21044C5 Self locking nuts

(4) Condensate drain connection items may be required. If condensate drain water from the port(s) located in the lower side panels of the evaporator assembly casing is objectionable, or creates a hazard, it must be piped to a safe disposal location. The air conditioner is equipped with two 1/4-18 NPT drain connections. The air conditioner is shipped from the factory with both of these ports plugged. These plugs must be removed prior to operation.

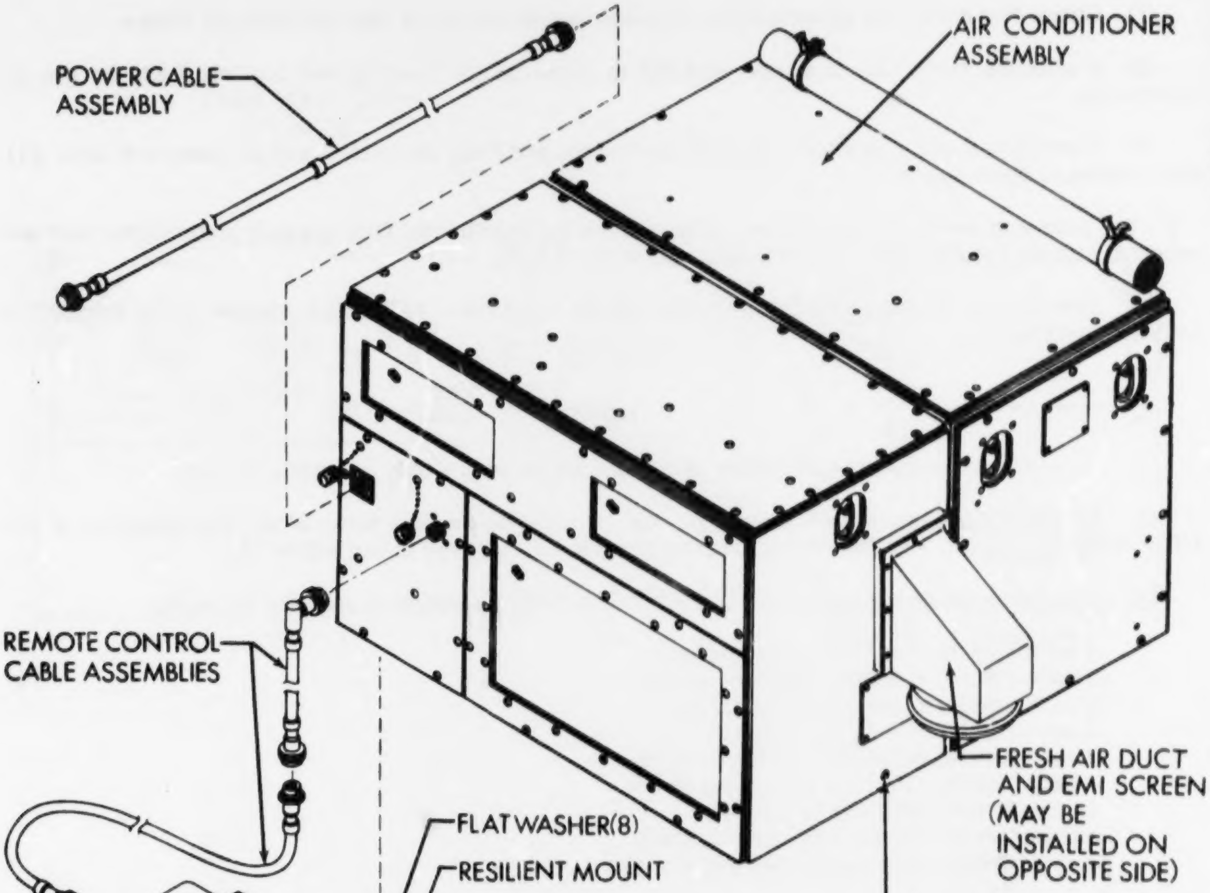


Figure 3-4. General Installation Items

3-6. AIR CONDITIONER REMOVAL/INSTALLATION

Equipment: Lifting sling
Tag line
Lifting equipment (wrecker)

Personnel: Three including wrecker operator

a. Removal

(1) Turn power to air conditioner off at circuit breaker.

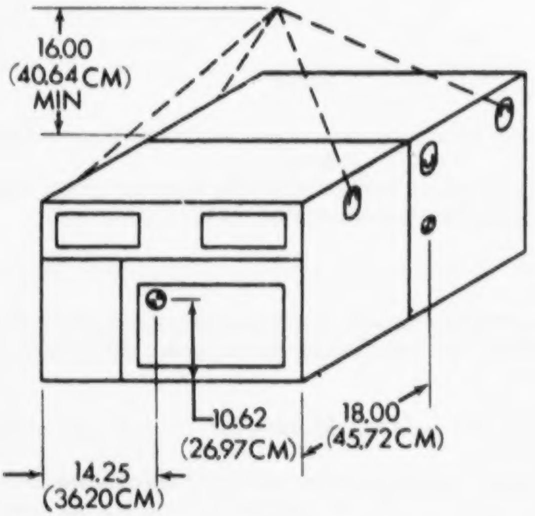
(2) Disconnect power cable and remote control cable to air conditioner at washboard (cable penetration point on shelter).

(3) Remove rain shield from around air conditioner to shelter joint. (See Shelter Manual.)

(4) Remove the fresh air duct and fresh air EMI screen. (See paragraph 3-13.)

(5) Disconnect condensate drain lines from air conditioner, if applicable.

(6) Using socket and ratchet wrench, remove eight each hex head screws, flat washers, and resilient mounts from the under side of the air conditioner mounting shelf.



GROSS WEIGHT 340 LB (166.2 KG)

TS4120-359-14/3-5

Figure 3-5. Hoisting Information

(7) Position lifting device (wrecker) so that lifting hook is centered over air conditioner.

WARNING

During the following operations, the mechanics must be visible to the wrecker operator and in a position to physically guide the air conditioner away from the shelter.

(8) Connect sling to the four outside corner air conditioner lifting rings and the lifting equipment (wrecker).

(9) Take care that mounting hardware and resilient mounts, between air conditioner and mounting shelf, are not damaged or lost. Lift the air conditioner slightly, and carefully move it away from shelter adapter enough to allow space to disconnect power cable and remote control cable.

(10) Disconnect power cable and remote control cable from the front of the air conditioner. Do not remove cables from shelter adapter duct.

WARNING

Do not allow anyone under equipment suspending by a lifting device. Do not allow the unit to swing while suspended from a lifting device.

(11) Lift the air conditioner off of the mounting shelf and place on tranport carrier or on ground.

(12) Disconnect sling from air conditioner.

(13) Remove mounting hardware and resilient mounts from mounting shelf and retain for reuse, if they are in good condition.

(14) Install the fresh air duct and fresh air EMI screen when air conditioner is relocated. (See paragraph 3-13.)

NOTE

Normally it is not necessary to remove the remote control assembly.

(15) When necessary, remove the remote control assembly from the inside of the shelter by loosening the four captive screws and disconnecting the remote control cable.

b. Installation

(1) Check to see that all packing material and shipping pallet have been removed from the air conditioner and remote control panel. Remove drain plugs or tape.

NOTE

The unit weight (less shipping pallet) is 340 pounds (166.2 kg). When lifting or moving the unit on the shipping pallet, a forklift, or overhead lifting device may be used. When removing the unit from the shipping pallet, or lifting the unit into position, an overhead lifting device must be used.

(2) See paragraph 3-5 for general information pertaining to site preparation and additional items required for installation that are not provided with the air conditioner.

(3) Check to see that power cable and remote control cable have been inserted through the air conditioner to shelter adapter. Place them so that they will not be damaged when the air conditioner is lifted into position.

(4) Check to see that power to air conditioner power cable has been turned off/disconnected.

(5) Remove the fresh air duct and fresh air EMI screen. (See paragraph 3-13.)

(6) Aline mounting hardware that is used between air conditioner and mounting shelf with slotted mounting holes. Loosely tape in place toward the front of the slotted holes. See figure 3-4.

(7) Position lifting device (wrecker) so that lifting hook is centered over air conditioner.

CAUTION

During the following operations, the mechanic(s) must be visible to the wrecker operator, and in some situations must steady and guide the air conditioner as it is lifted into position.

(8) Connect sling to the four outside corner air conditioner lifting rings and the lifting equipment (wrecker). See figure 3-5.

WARNING

Do not allow anyone under equipment suspended by a lifting device.

Do not allow the unit to swing while suspended from a lifting device.

(9) Carefully lift the air conditioner into position over the mounting shelf approximately 5 to 6 inches (12.7 to 15.2 cm) away from the air conditioner adapter opening.

(10) Connect power cable and remote control cable to connectors on front of air conditioner.

CAUTION

Take care that shock mounts are not damaged.

(11) Slowly lower air conditioner into position, aline, and loosely attach remaining installation hardware.

(12) With air conditioner slightly supported by lifting device (wrecker), push air conditioner firmly toward shelter to compress weather seal. At the same time, release tension on lifting device and secure the installation hardware.

(13) Remove sling attachments from air conditioner and move lifting device (wrecker) out of the way.

(14) Install the rain shield around the air conditioner to shelter joint. (See Shelter Manual.)

(15) Install the fresh air duct and fresh air EMI screen. (See paragraph 3-13.)

NOTE

The fresh air intake duct and fresh air EMI screen may be mounted on the left or right side of the air conditioner by exchanging it with the fresh air cover plate.

(16) Connect all drain lines or hoses, if applicable.

(17) Roll the fabric condenser cover up and tie it in place.

(18) Check to see that power cable and remote control cable(s) are connected at shelter washboard.

(19) Install the remote control assembly in the shelter if removed. The cable must be connected first. Then aline the four captive screws and turn them evenly to obtain a good EMI gasket seal.

(20) Turn power to air conditioner on at circuit breaker.

(21) See paragraph 2-4 and check air conditioner operation in all operating modes.

Section III PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-7. GENERAL

Systematic, periodic, preventive maintenance checks, and services (PMCS) are essential to insure that the air conditioner is ready for operation in any mode at all times. The purpose of a preventive maintenance program is to discover and correct defects and deficiencies before they can cause serious damage or complete failure of the equipment. Any effective preventive maintenance program must begin with the training of operators to report all unusual conditions noted during daily checks or actual operation to organizational maintenance. All defects and deficiencies discovered during maintenance inspections must be recorded, together with corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

3-8. INSPECTION AND SERVICE SCHEDULING

a. A schedule for organizational preventive maintenance inspection and service should be established immediately after installation of the air conditioner. A quarterly interval, equal to three calendar months or 250 hours of operation, whichever occurs first, is recommended for usual operating conditions. When operating under unusual conditions, such as a very dusty or sandy environment, it may be necessary to reduce the interval to monthly or even less if conditions are extreme.

b. Table 3-1 lists the organizational preventive maintenance checks and services that should be performed at quarterly (or otherwise established) intervals. The PMCS items in the table have been arranged and numbered in a logical sequence to provide for greater personnel efficiency and least amount of required maintenance downtime.

NOTE

Check all air filters weekly for air flow blockage.

Table 3-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

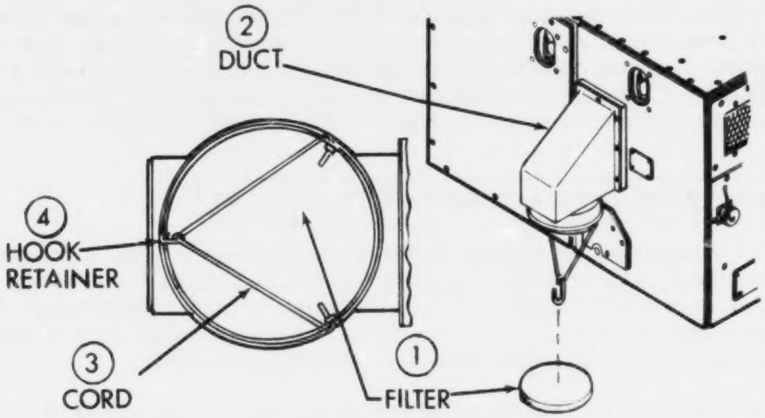
Item No.	Item To Be Inspected/Serviced	Procedures
		 BOTTOM VIEW (FILTER IN PLACE) TS4120-359-14/T3-1-1
1	Filter, Air Conditioning (Fresh Air) (See note at end of para 3-8.b)	a. Release hook retainer and remove filter. b. Clean in a mild detergent and water solution. c. Rinse in clear water and shake out excess water. d. Inspect for any damage, such as punctures or cuts that would allow passage of unfiltered air. e. Inspect for packed or mashed filter material that would block air flow. f. Replace filter if found bad. **NOTE** The return air filter is not a part of the air conditioner. It will be found in the shelter return air duct. See maintenance instructions for shelter, and clean this filter.
2	Duct, Fresh Air	a. Check that inlet is not blocked and no source of fumes or excessive heat are within 10 feet (3.1 meters) of the air inlet. b. Inspect for cracks, dents, and punctures that would block airflow or allow unfiltered air to enter air conditioner. c. Wipe dust and dirt from inside surfaces with a clean cloth. d. Reinstall the filter.
3	Cord, Elastic (Filter Retainer)	a. Inspect for cuts, breaks, and excessive wear. b. Check that it is in place and properly tied.
4	Hook Retainer (Filter)	a. Check that hook is in good condition. b. Check that hook is securely in place to retain filter.

Table 3-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

<table>
<tr><th>Item No.</th><th>Item To Be Inspected/Serviced</th><th>Procedures</th></tr>
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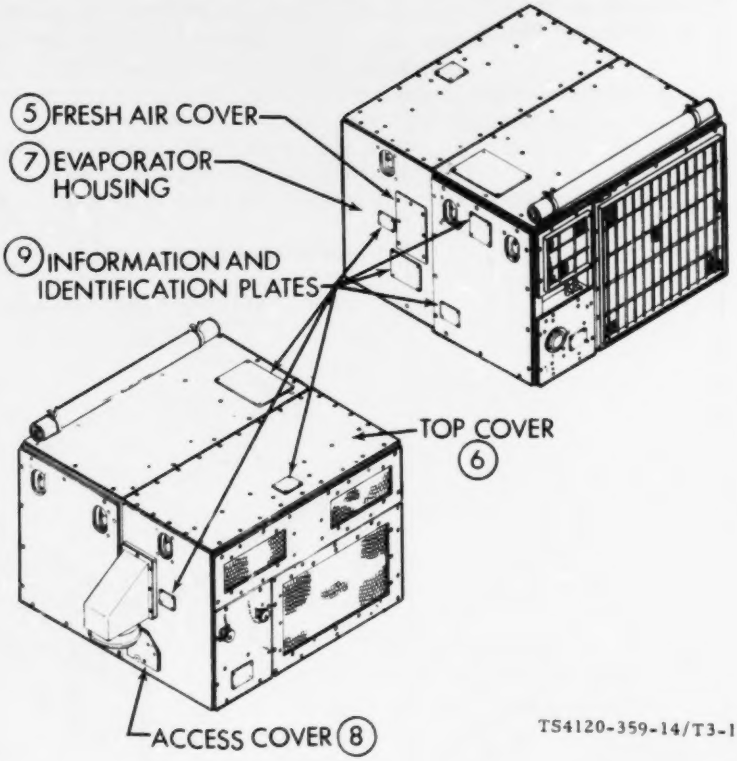

TS4120-359-14/T3-1-2

EVAPORATOR SECTION OUTSIDE PANELS
</td></tr>
<tr><td>5
6
7

8</td><td>Fresh Air Cover
Top Cover
Evaporator Housing (Exposed portions only)
Access Cover</td><td>
a. Check that there are:
No major dents
No punctures or cracks
No missing hardware
b. Check that gaskets are in good condition and that they seal properly.
Gaskets on these items act both as an air seal and as an EMI seal.
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</table>

Table 3-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

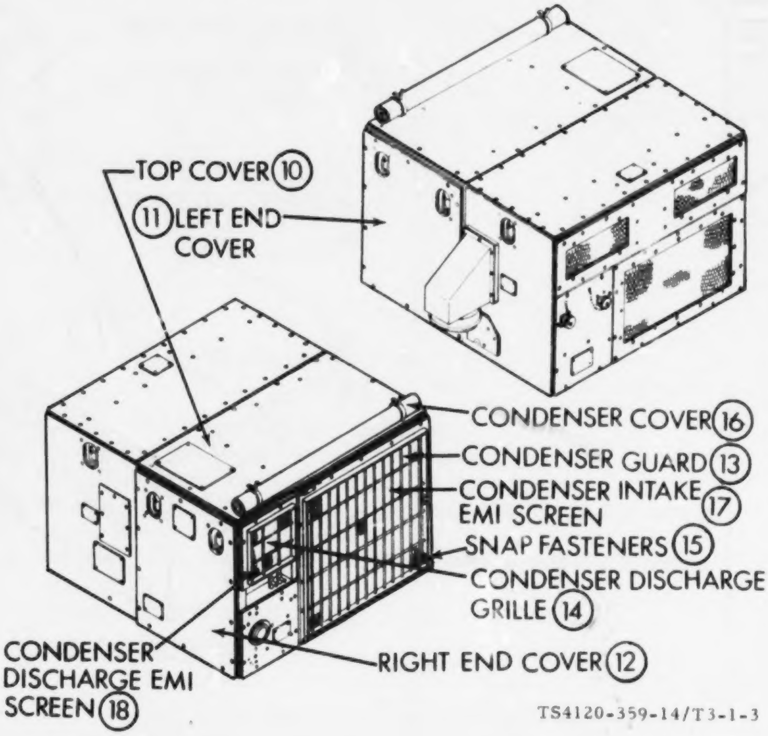
Item No.	Item To Be Inspected/Serviced	Procedures
9	Information and Identification Plates	a. Check that all Warning, information and identification plates are in place and legible. See figure 2-17 for identification and locations of these plates.  TOP COVER ⑩ ⑪ LEFT END COVER CONDENSER COVER ⑯ CONDENSER GUARD ⑬ CONDENSER INTAKE EMI SCREEN ⑰ SNAP FASTENERS ⑮ CONDENSER DISCHARGE GRILLE ⑭ RIGHT END COVER ⑫ CONDENSER DISCHARGE EMI SCREEN ⑱ TS4120-359-14/T3-1-3 CONDENSER SECTION OUTSIDE PANELS
10 11 12	Top Cover Left End Cover Right End Cover	a. Check that there are: No major dents No punctures or cracks No missing hardware b. Check that gaskets are in good condition and that they seal properly. Gaskets on these items act both as an air seal and as an EMI seal.
13 14	Condenser Guard Condenser Discharge Grille	a. Check that there is no damage. b. Check that they are not blocked in any way.

Table 3-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

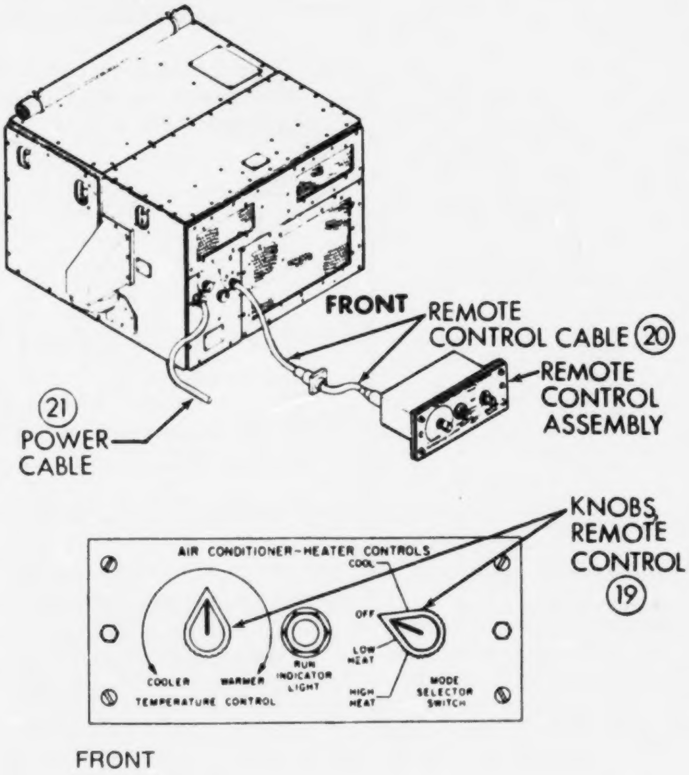
Item No.	Item To Be Inspected/Serviced	Procedures
15 16	Snap Fasteners Condenser Cover	a. Untie and roll condenser cover down. b. Check for tears, worn edges, and holes. c. Check for accumulated dirt and mildew. d. If the necessity of washing is indicated, use fresh water with a small amount of a mild detergent. Dry thoroughly. e. Snap cover closed and check snaps. f. Unsnap, roll cover up and tie in place.
17 18	Condenser Intake EMI Screens Condenser Discharge EMI Screen	a. Observe for damages, such as punctures, cuts, or mashed areas. b. Observe for air flow blockage.
		 FRONT REMOTE CONTROL CABLE ⑳ REMOTE CONTROL ASSEMBLY ㉑ POWER CABLE KNOBS, REMOTE CONTROL ⑲ AIR CONDITIONER-HEATER CONTROLS COOL OFF LOW HEAT HIGH HEAT MODE SELECTOR SWITCH COOLER WARMER TEMPERATURE CONTROL RUN INDICATOR LIGHT FRONT
19	Knobs, Remote Control	a. Check that remote control knobs are in place and not broken.
20 21	Remote Control Cable (Visible Portions) Power Cable (Visible Portions)	a. Check that cable is in good condition. b. Check that cable is placed so that it will not be damaged or create problems for operating personnel. c. Check that all connections are tight.

Table 3-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

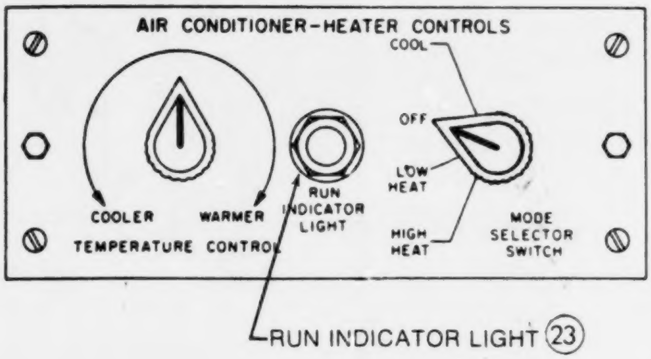
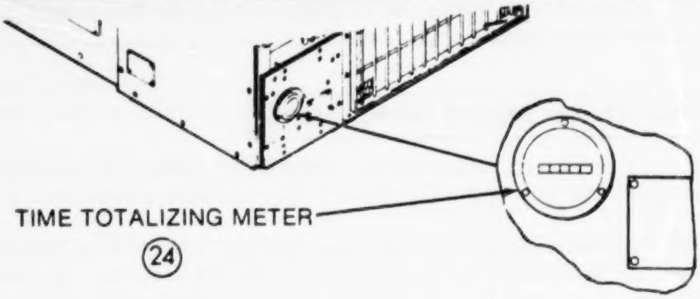
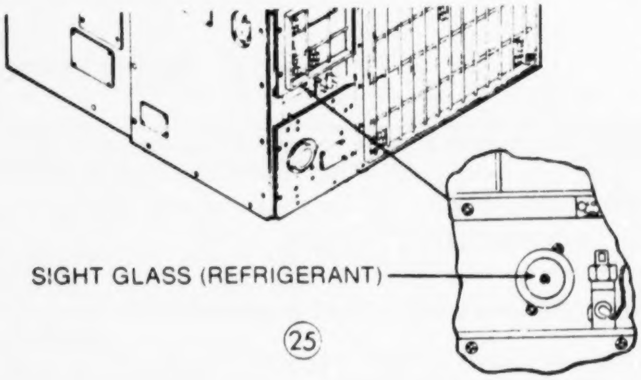
Item No.	Item To Be Inspected/Serviced	Procedures
22	Operational Checks	a Be sure the mode selector switch is in the OFF position. **CAUTION** If military operational considerations allow the time, it will help extend the life of the compressor if the air conditioner is not turned on for its check of operation in the COOL mode until after a sufficient time to eliminateany danger of liquid refrigerant accumulation in the compressor. Except in extremely cold conditions, if input power has been disconnected for a period of less than six hours, an equal warn-up period is desirable. If the disconnected period has been more than six hours, a full six-hour warm-up period is recommended. b. Perform functional check of the air conditioner in all operational modes in accordance with the instructions in paragraph 2-4.  AIR CONDITIONER-HEATER CONTROLS COOL OFF LOW HEAT HIGH HEAT MODE SELECTOR SWITCH RUN INDICATOR LIGHT COOLER WARMER TEMPERATURE CONTROL RUN INDICATOR LIGHT ㉓
23	Run Indicator Light	a. Light should be illuminated in all operating modes. b. Light may also be checked with MODE SELECTOR SWITCH in OFF position. Push in. Light should light. c. Replace bulb if necessary. (See para 3-30.)

Table 3-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (cont.)

Item No.	Item To Be Inspected/Serviced	Procedures
		
24	Time Totalizing Meter	a. Meter should operate in all operating modes.
		
25	Sight Glass	a. Operate air conditioner at least 15 minutes in COOL MODE with TEMPERATURE CONTROL set at COOLER. b. Center indicator on sight glass should be green. Refrigerant should be clear with no bubbles. c. If center indicator is yellow, or refrigerant is milky, or bubbles are seen, report condition to direct support maintenance.
26	Condensate Drain	After air conditioner has been running in cool mode, check it to see that no water is dripping, except through drain. Set-up the air conditioner for the desired operational mode. Record performance of quarterly PMCS, including all corrective actions taken. **NOTE** If the air conditioner has been in operation under unusual conditions, the above PMCS items may be modified as necessary to meet the further requirements due to the unusual conditions.

Section IV TROUBLESHOOTING

3-9. GENERAL

Troubleshooting by organizational maintenance is limited to checking operation of the air conditioner. Any failure in performance or suspected problem, other than those described in table 3-2, should be reported to direct support maintenance.

3-10. USE OF TROUBLESHOOTING TABLE

Table 3-2 contains troubleshooting information useful to organizational maintenance technicians in diagnosing and correcting malfunctions or unsatisfactory operation of the air conditioner.

a. The troubleshooting table lists the common malfunction symptoms and unsatisfactory performance characteristics that technicians are most likely to encounter; test and inspection steps to be followed to determine the cause; and the corrective action(s) that should be performed for each possible cause are listed.

b. The technician should first find the malfunction symptom or unsatisfactory performance characteristic in the table which most closely describes the immediate situation; then perform the test and inspections, and corrective action steps in the order in which they are listed.

Table 3-2. TROUBLESHOOTING

MALFUNCTION
  TEST OR INSPECTION
    CORRECTIVE ACTION

1. AIR CONDITIONER WILL NOT START IN ANY MODE.

Step 1. Press run indicator light. If light illuminates contact direct support.
Step 2. Check to see if air conditioner power circuit breaker in shelter has been turned off or tripped.
  Reset circuit breaker.
Step 3. Check to see if power cable to air conditioner has been disconnected.
  Connect power cable.
Step 4. Check to see if remote control cable has been disconnected.
  Connect remote control cable.

CAUTION

Provided that military operational considerations allow the time, it is desirable, if the power has been disconnected for an unknown period of time, to wait six hours after reconnection before starting in the COOL mode. (See the caution in table 3-1, page 3-18.)

2. INSUFFICIENT COOLING.

Step 1. Check to see that MODE SELECTOR SWITCH is properly positioned.
  Set switch to COOL.
Step 2. Check to see that TEMPERATURE CONTROL is set to COOLER position
  Set TEMPERATURE CONTROL to COOLER position.
Step 3. Inspect fresh and return air filters, for dirt or blockage.
  Clean filter/remove blockage.

Table 3-2. TROUBLESHOOTING (cont.)

MALFUNCTION
  TEST OR INSPECTION
    CORRECTIVE ACTION

Step 4. Check that condenser air is not blocked.
Fabric condenser cover must be rolled up and tied. Remove any obstruction from condenser inlet or discharge.

Step 5. Check that high pressure cutout reset is not tripped.
Press in to reset.

Step 6. After 15 minutes of operation in COOL MODE with TEMPERATURE CONTROL set to COOLER position, check sight glass. Refrigerant should be clear and center indicator should be green. If refrigerant is milky/bubbly or center indicator is yellow, report condition to direct support maintenance.

3. INSUFFICIENT HEATING.

Step 1. Check to see that MODE SELECTOR SWITCH is properly positioned.
Set switch to LOW HEAT or HIGH HEAT.

NOTE

During LOW HEAT operation only, one bank of the heaters (nine) is operational. These heaters are thermostatically controlled by the TEMPERATURE CONTROL.

During HIGH HEAT operation, the second bank of the heaters (six) operate continuously.

Step 2. Check that TEMPERATURE CONTROL is set to WARMER position.
Set TEMPERATURE CONTROL to WARMER position.

Step 3. Inspect fresh and return air filters for dirt or blockage.
Clean filter(s)/remove blockage

4. RUN INDICATOR LIGHT DOES NOT ILLUMINATE WITH AIR CONDITIONER OPERATING

Step 1. Press light in. Light should illuminate.
Replace bulb.

Section V MAINTENANCE PROCEDURES

3-11. GENERAL

The procedures in this section have been arranged in the order in which the items appear in the organizational (O) maintenance level column on the Maintenance Allocation Chart (MAC) which is provided in Appendix B. Step-by-step procedures have been provided for all actions authorized to be performed by organizational maintenance in the order in which they appear on the MAC. Actions authorized to be performed by direct and general support maintenance have been duly noted; step-by-step procedures for these actions may be found in Chapters 4 and 5, respectively.

3-12. FRESH AIR FILTER, RETAINER CORD, AND HOOK

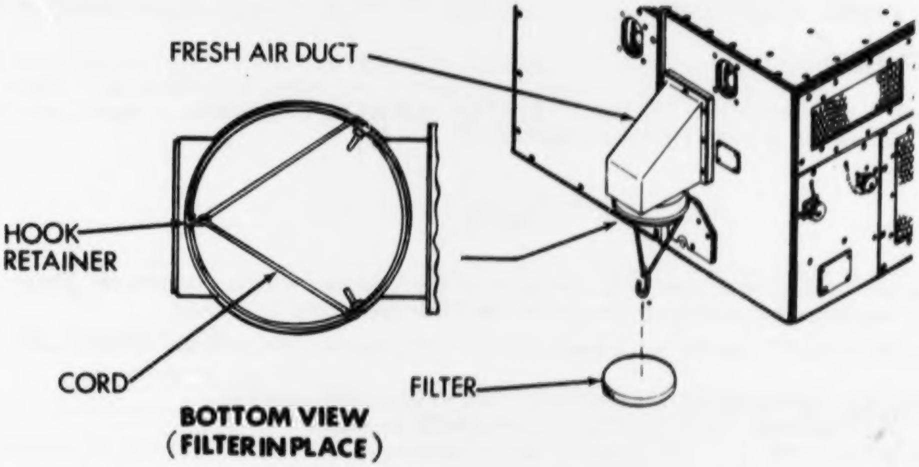


Figure 3-6. Fresh Air Filter, Cord, and Hook

a. Filter removal

(1) Release hook retainer.

(2) Slip filter down and out of duct.

b. Clean filter

(1) Wash filter in a mild detergent and water solution.

(2) Rinse thoroughly in clear water.

(3) Shake out excess water prior to installation.

c. Inspect

(1) Check filter for punctures, cuts, and damaged edges that would allow passage of unfiltered air.

(2) Check filter for packed or mashed areas that would block air flow.

(3) Replace filter if found bad.

(4) Check that hook retainer is in place and in good condition.

(5) Inspect cord for cuts, breaks, or excessive wear. If cord replacement is necessary, contact direct support. (See para 4-15.)

d. Removal cord and hook

(1) With hook released, pull end of cord free and untie knot in end of cord.

(2) Slip hook from free end of cord.

(3) Pull cord thru remaining hole.

e. Installation-cord and hook

(1) With one end of cord tied with an overhand knot, slip end of cord that is not tied thru one of the double set of holes from inside of duct. (See figure 3-6.)

(2) Thread the cord back thru the duct.

(3) Slip the hook onto the cord.

(4) Attach the hook through the single hole, and thread the cord out thru one of the remaining set of two holes.

(5) Thread the cord back through the remaining hole, and tie an overhand knot so that cord has a slight tension when hooked in place.

f. Installation-filter

(1) Check to see that cord and hook have been released.

(2) Wipe dust and dirt from inside surface of fresh air duct with a clean cloth.

(3) Slip filter up and into place.

(4) Attach hook and cord.

3-13. FRESH AIR DUCT AND EMI SCREEN

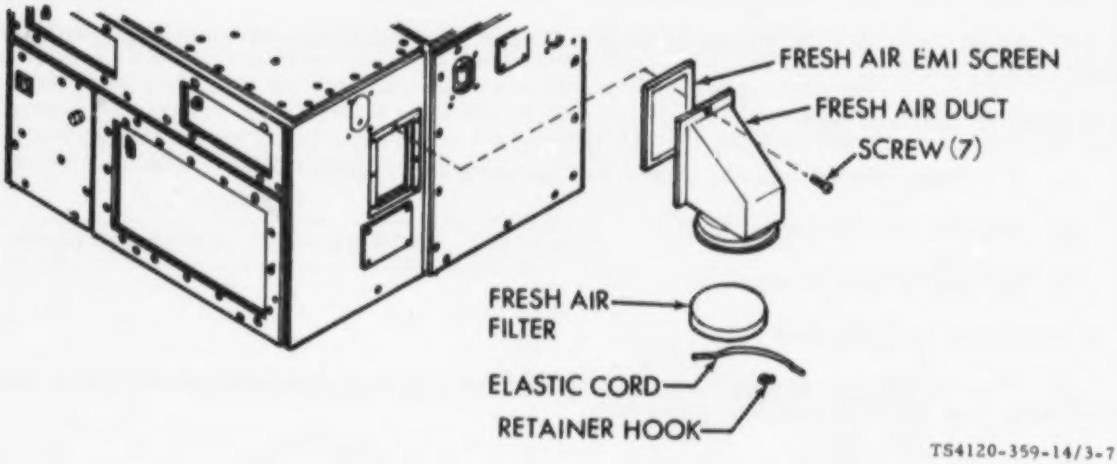


Figure 3-7. Fresh Air Duct and EMI Screen

NOTE

The fresh air duct and fresh air EMI screen may be mounted on the left or right side of the air conditioner by exchanging it with the fresh air cover plate.

a. Removal

CAUTION

Take care that EMI gaskets and screen are not damaged.

(1) Using screwdriver, remove the seven screws.

(2) Carefully lift the fresh air duct and fresh air EMI screen from the air conditioner.

NOTE

Fresh air filter, elastic cord, and hook need not be removed unless duct is to be replaced.

b. Inspection

(1) Check that duct is not dented so that air flow would be blocked.

(2) Check that duct has no holes, cracks, or openings that would allow air to enter other than through filter.

(3) Replace duct if found bad.

(4) Check that gaskets on duct are not cracked, loose, or missing.

(5) Refer duct gasket repair/replacement and inspection/replacement of EMI screen to direct support.

(6) If duct is to be replaced, see paragraph 3-12 for removal/installation of fresh air filter, cord, and hook.

c. Clean

(1) If inside surface of duct and the air passage area of the screen are dirty, clean them with a clean cloth, soft brush, or mild detergent and water solution.

(2) If detergent solution was used, rinse with clear water and shake off excess water before installation.

d. Installation

(1) Line up screw holes in duct, screen, and air conditioner housing.

(2) Using screwdriver, install duct and filter with seven screws.

(3) If the fresh air filter, cord and hook were removed, see paragraph 3-12 and install them.

3-14. ACCESS COVER

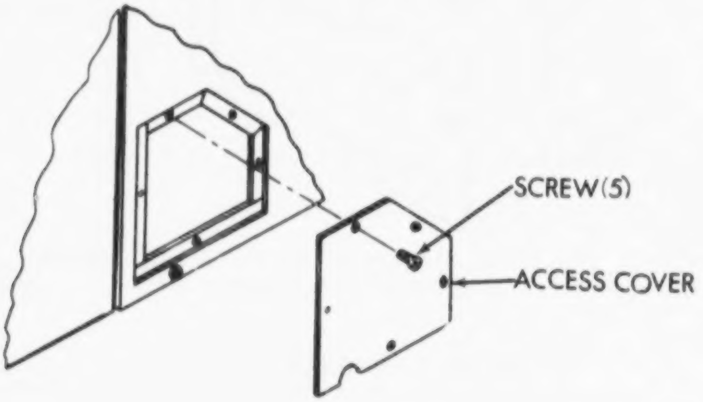


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Figure 3-8. Access Cover

a. Removal

WARNING

Disconnect electrical power prior to removing outside covers. Turning unit off at control module does not disconnect power to air conditioner.

(1) Turn air conditioner off at circuit breaker and disconnect power cable at washboard.

(2) Using screwdriver, remove five screws.

(3) Carefully remove the access cover.

b. Inspection

(1) Check that cover is not bent or punctured. Replace if damaged.

(2) Check that EMI gaskets are not cracked, loose, or missing. Refer gasket replacement/repair to direct support.

c. Installation

(1) Line up screw holes in cover and air conditioner housing.

(2) Using screw driver, install cover with five screws.

(3) Connect power cable at washboard and turn air conditioner circuit breaker on.

3-15. DRAIN PLUGS

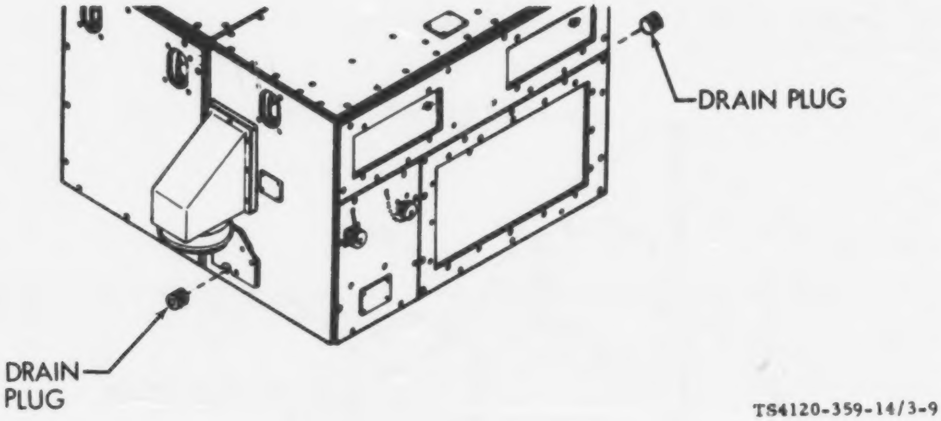


Figure 3-9. Drain Plugs

The unit is shipped from the factory with drain plugs installed. These plugs must be removed prior to operation.

CAUTION

Failure to remove these plugs will cause water to collect in the bottom of the evaporator section assembly and possible spillage into shelter.

See installation instructions, paragraph 3-5. b(4), for drain line connection information.

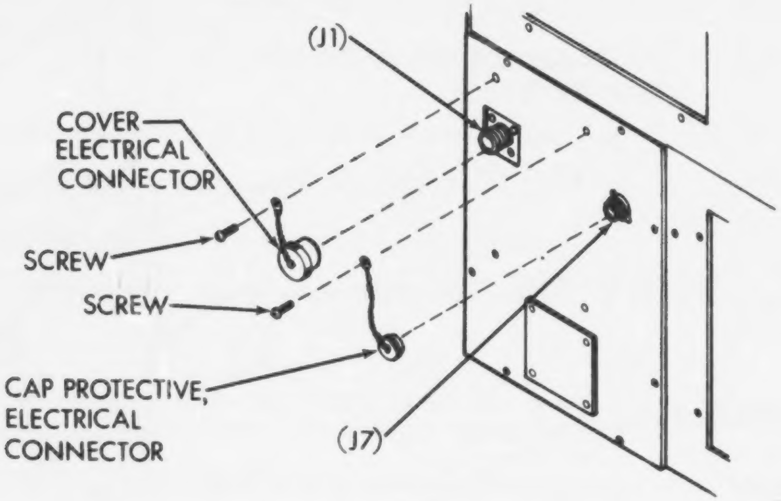
a. Removal. Prior to operation remove drain plugs from both sides of air conditioner using allen wrench.

b. Inspection. Prior to air conditioner operation, check to see that drain plugs have been removed.

c. Installation. For shipment or extended storage, drain plugs must be reinstalled or drain holes taped closed

3-16. PROTECTIVE ELECTRICAL CONNECTOR CAPS AND COVERS

Preliminary Procedure: Remove air conditioner from shelter. (See paragraph 3-6.)


(J1)
COVER ELECTRICAL CONNECTOR
SCREW
SCREW
CAP PROTECTIVE, ELECTRICAL CONNECTOR
(J7)

TS4120-359-14/3-10

Figure 3-10. Protective Electrical Connector Caps and Covers

a. Inspection. Check that internal threads are not damaged, and that chain is in place. If cap or cover will not screw on connector, or chain is missing, the cap or cover should be replaced.

b. Removal

(1) Using screwdriver, remove the screw from the end of the chain.

(2) Unscrew cap or cover from the connector.

c. Installation

(1) Screw the cap or cover in place on the connector.

(2) Using screwdriver, attach the end of the chain to the front evaporator cover.

Follow-on Procedure: Install air conditioner on shelter. (See paragraph 3-6.)

3-17. FRONT EVAPORATOR COVER

Preliminary Procedure: Remove air conditioner from shelter. (See paragraph 3-6.)

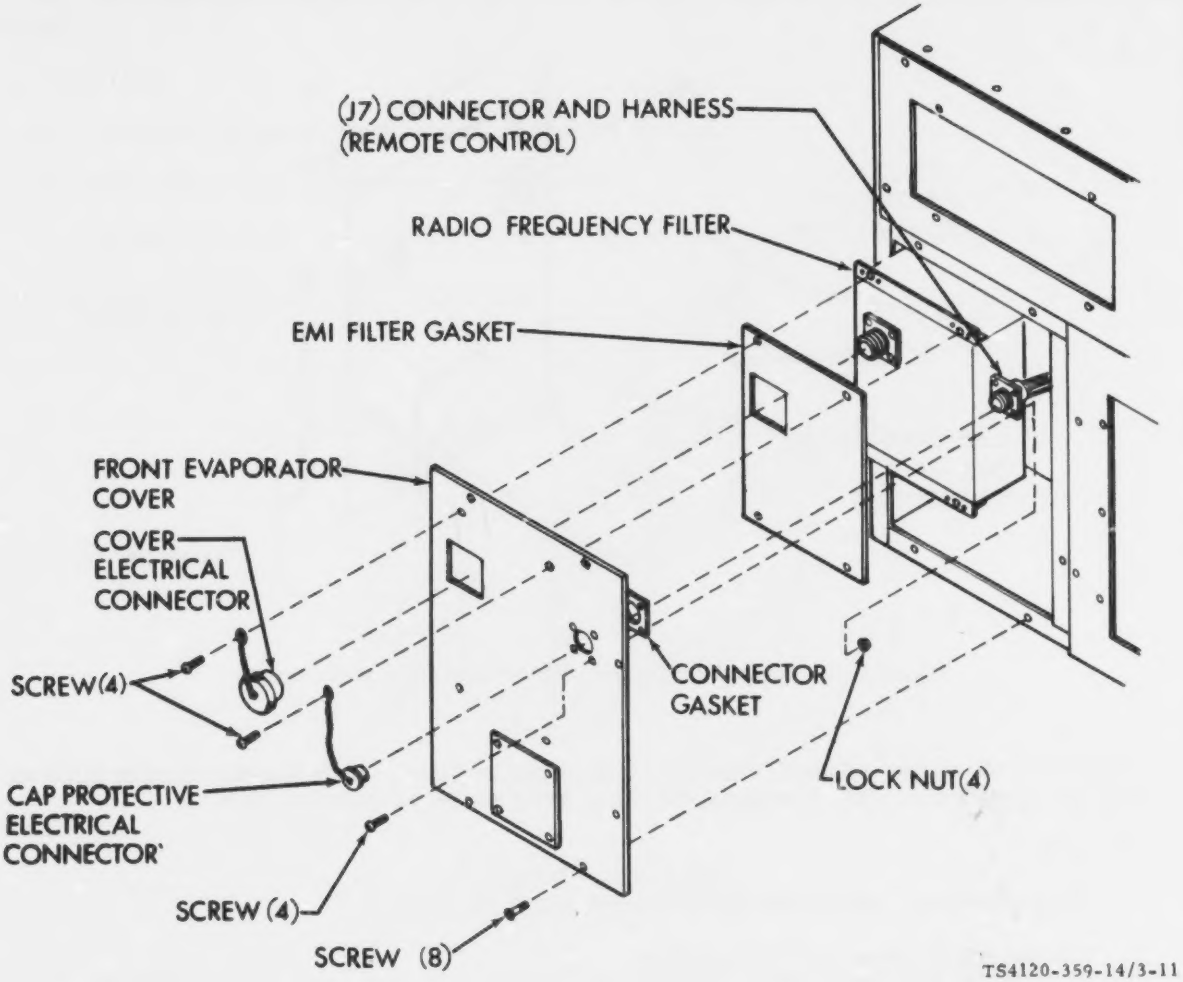


Figure 3-11. Front Evaporator Cover

a. Removal

(1) Using screwdriver, remove eight screws from the outside edges while supporting (holding) cover.

(2) Carefully slip front cover out and down so that the radio frequency filter can be supported (held) while it is removed.

(3) Using screwdriver, remove four screws from the radio frequency filter. The protective cap and cover for the electrical connectors will come off when the top two screws are removed. Take care that they are not lost.

(4) Set the filter down on the inside of the evaporator housing. Take care that the EMI filter gasket is not damaged or lost.

(5) Using a screwdriver, socket, and ratchet, remove the four screws and lock nuts from the remote control harness connector (J7).

(6) Remove the connector (J7) harness and connector gasket from the back side of the cover. Take care that the connector gasket is not lost.

b. Inspection

(1) Check that cover is not bent or punctured. Replace if damaged.

(2) Check that danger plate is in place and legible.

(3) Check that EMI gaskets are not cracked, loose, or missing.

(4) Refer replacement of danger plate and replacement/repair of gaskets to direct support.

c. Installation

(1) Using a screwdriver, socket and ratchet, attach the remote control harness connector (J7) and connector gasket to the front evaporator cover with four screws and lock nuts.

(2) Aline the holes in the EMI gasket, radio frequency filter, and front evaporator cover.

(3) Using a screwdriver, install the two bottom screws in the cover and radio frequency filter.

(4) Using a screwdriver, attach the chain ends for the protective connector cap and cover when the two top radio frequency mounting screws are installed.

(5) Line up screw holes in cover and air conditioner housing.

(6) Using screwdriver, install cover with eight screws.

Follow-on Procedure: Install air conditioner on shelter: (See paragraph 3-6.)

3-18. RETURN AIR SCREEN AND FRAME

Preliminary Procedure: Remove air conditioner from shelter. (See paragraph 3-6.)

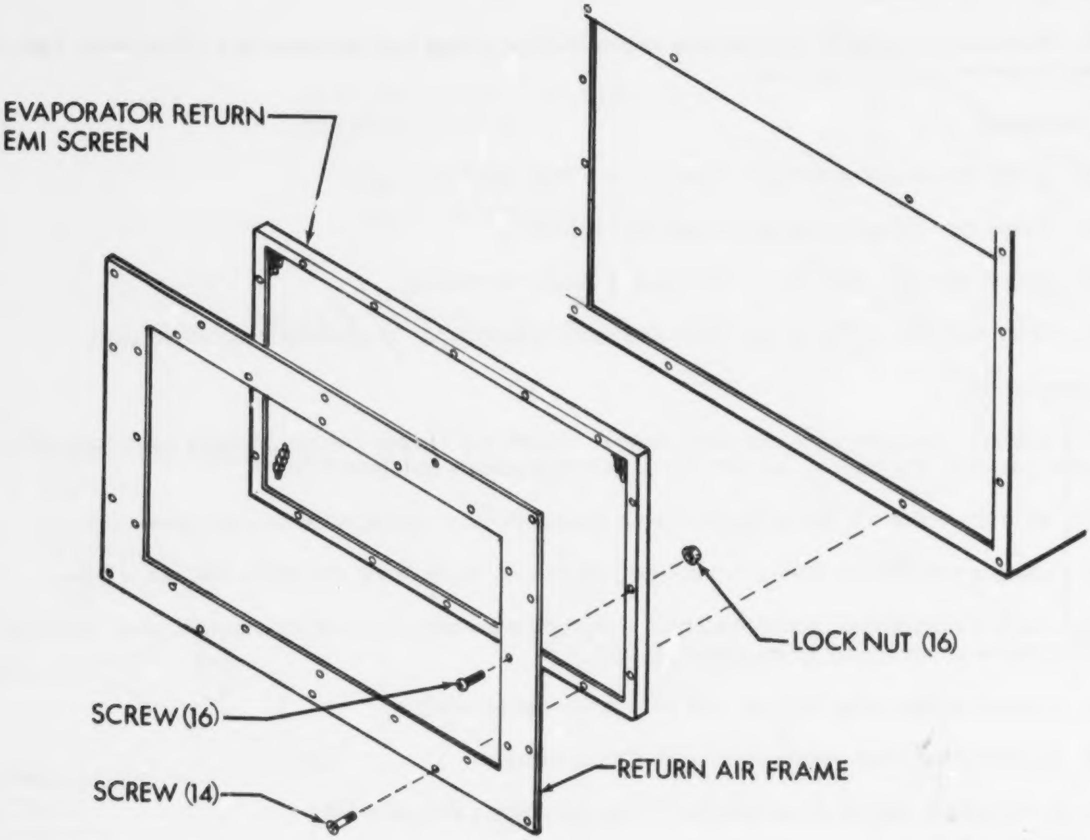


Figure 3-12. Return Air Screen and Frame

a. Removal

(1) Using screwdriver, remove fourteen screws from the outside edges of the frame.

(2) Being careful not to damage the EMI gasketing and screen, lift frame from housing.

(3) Using screwdriver, socket, and ratchet, remove the sixteen screws and lock nuts and remove the EMI screen from the frame.

b. Inspection

(1) Check that return air frame is not bent, cracked, or punctured. Replace if damaged.

(2) Check that EMI gaskets are not cracked, loose, or missing.

(3) Refer replacement/repair of gaskets and inspection/replacement of EMI screen to direct support.

c. installation

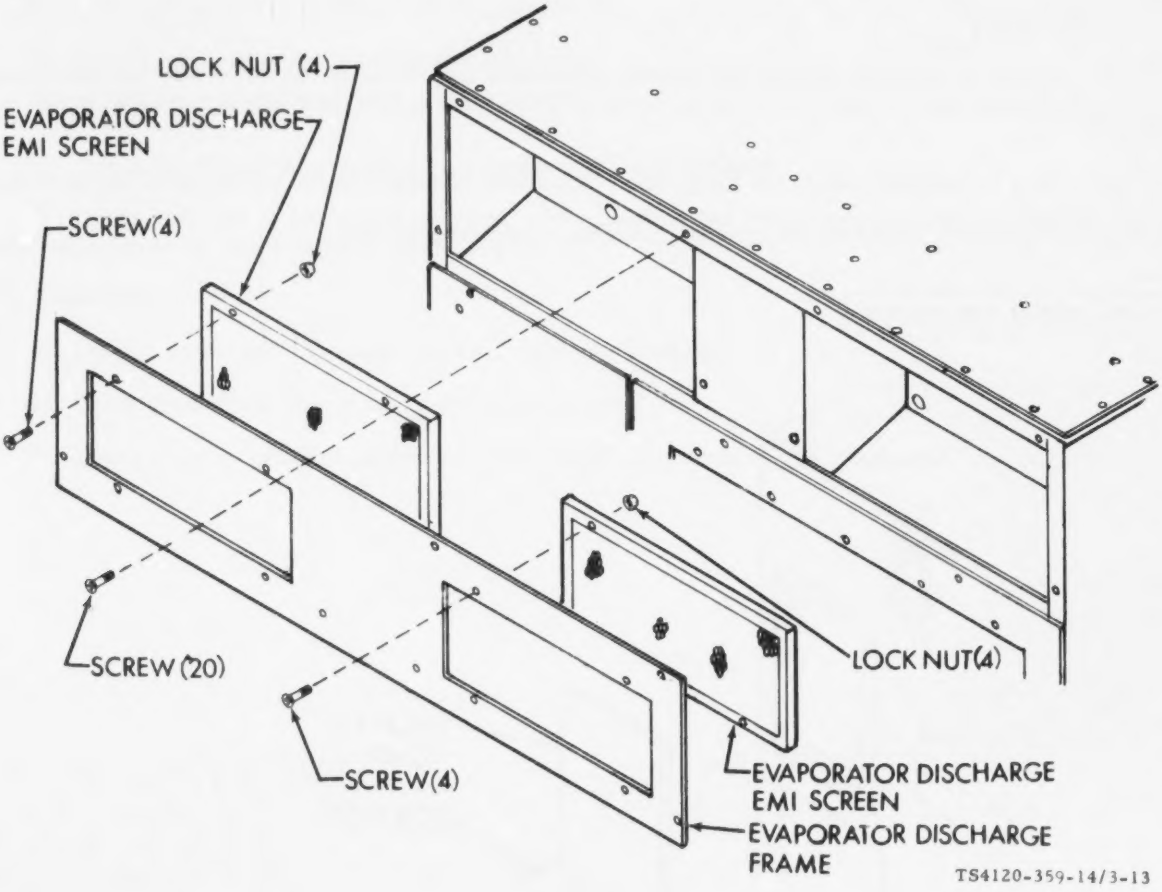
(1) Using a screwdriver, socket, and ratchet attach the EMI screen to the frame with sixteen screws and lock nuts. Be sure that hardware is tightened evenly, and that there are no gaps between the EMI screen and frame.

(2) Using screwdriver, install the assembled EMI screen and frame to the housing with fourteen screws.

Follow-on Procedure: Install air conditioner on shelter. (See paragraph 3-6.)

3-19. EVAPORATOR DISCHARGE EMI SCREEN AND FRAME

Preliminary Procedure: Remove air conditioner from shelter (See paragraph 3-6.)


LOCK NUT (4)
EVAPORATOR DISCHARGE EMI SCREEN
SCREW(4)
SCREW (20)
SCREW(4)
LOCK NUT(4)
EVAPORATOR DISCHARGE EMI SCREEN
EVAPORATOR DISCHARGE FRAME

TS4120-359-14/3-13

Figure 3-13. Evaporator Discharge EMI Screen and Frame

a. Removal

(1) Using screwdriver, remove twenty screws from the outside edges of the frame.

(2) Being careful not to damage the EMI gasketing and screens, lift frame from housing.

(3) Using screwdriver, socket, and ratchet, remove four each screws and lock nuts from each of the two EMI screens. Remove the screens from the frame.

b. Inspection

(1) Check that return air frame is not bent, cracked, or punctured. Replace if damaged.

(2) Check that EMI gaskets are not cracked, loose, or missing.

(3) Refer replacement/repair of gaskets and inspection/replacement of EMI screens to direct support.

c. Installation

(1) Using a screwdriver, socket, and ratchet, attach each EMI screen to the frame with four screws and lock nuts. Be sure that hardware is tightened evenly and that there are no gaps between the EMI screen and frame.

(2) Using screwdriver, install the assembled EMI screens and frame to the housing with twenty screws.

Follow-on Procedure: Install air conditioner on shelter: (See paragraph 3-6.)

3-20. FRESH AIR COVER

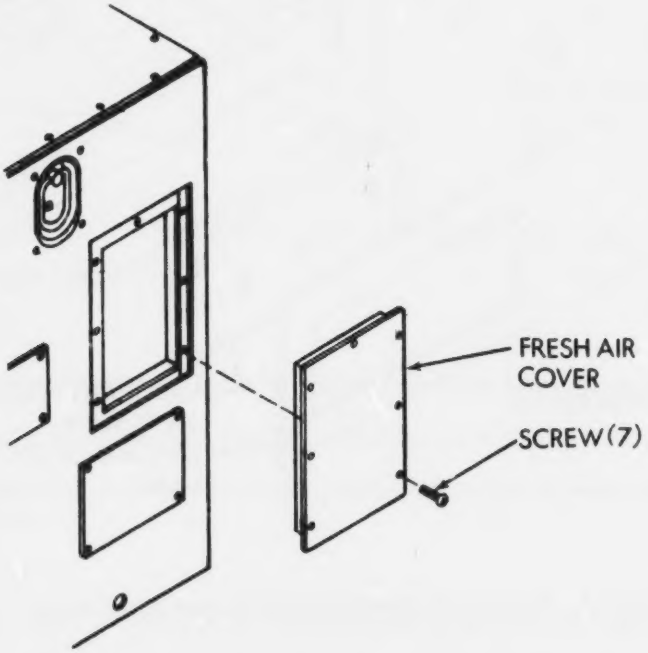


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Figure 3-14. Fresh Air Cover

NOTE

The fresh air cover may be mounted on the left or right side of the air conditioner by exchanging it with the fresh air duct and fresh air EMI screen.

a. Removal

WARNING

Disconnect electrical power prior to removing outside covers. Turning unit off at control module does not disconnect power to air conditioner.

(1) Turn air conditioner off at circuit breaker, and disconnect power cable at washboard.

(2) Using screwdriver, remove the seven screws.

(3) Lift the fresh air cover from the air conditioner.

b. Inspection

(1) Check that cover is not bent or punctured. Replace if damaged.

(2) Check that EMI gaskets, inside cover, and insulation are not cracked, loose, or missing. Refer repair/replacement of these items to direct support.

c. Installation

(1) Line up screw holes in cover and air conditioner housing.

(2) Using screwdriver, install cover with seven screws.

(3) Connect power cable at washboard and turn air conditioner circuit breaker on.

3-21. TOP EVAPORATOR COVER

Preliminary Procedure: Remove shelter adapter rain shield. (See Shelter Manual.)

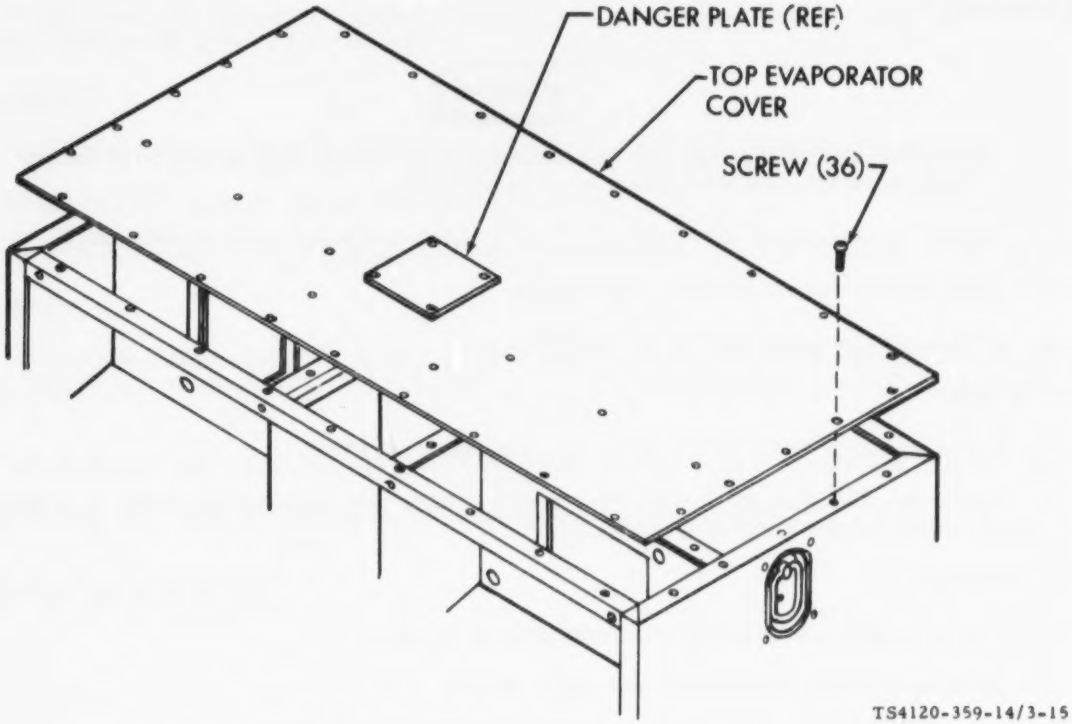

Figure 3-15. Top Evaporator Cover

a. Removal

WARNING

Disconnect electrical power prior to removing outside covers. Turning unit off at control module does not disconnect power to air conditioner.

(1) Turn air conditioner off at circuit breaker and disconnect power cable at washboard.

(2) Using screwdriver, remove thirty-six screws.

(3) Carefully lift the top cover from the air conditioner.

b. Inspection

(1) Check that cover is not bent or punctured. Replace if damaged.

NOTE

The danger plate is not supplied as part of the top evaporator cover assembly.

(2) Check that EMI and other gaskets and insulation are not cracked, loose, or missing. Refer gasket and insulation replacement/repair to direct support.

(3) Check that danger plate is readable and in place. Refer replacement to direct support.

c. Installation

(1) Line up screw holes in cover and air conditioner housing.

(2) Using screwdriver. install cover with thirty-six screws.

(3) Connect power cable at washboard and turn air conditioner circuit breaker on.

Follow-on Procedure: Install air conditioner on shelter. (See paragraph 3-6.)

3-22. FEED THRU COVER

Preliminary Procedures: 1. Remove air conditioner from shelter. (See paragraph 3-6.)

2. Separate evaporator and condenser section assemblies. (Direct Support)

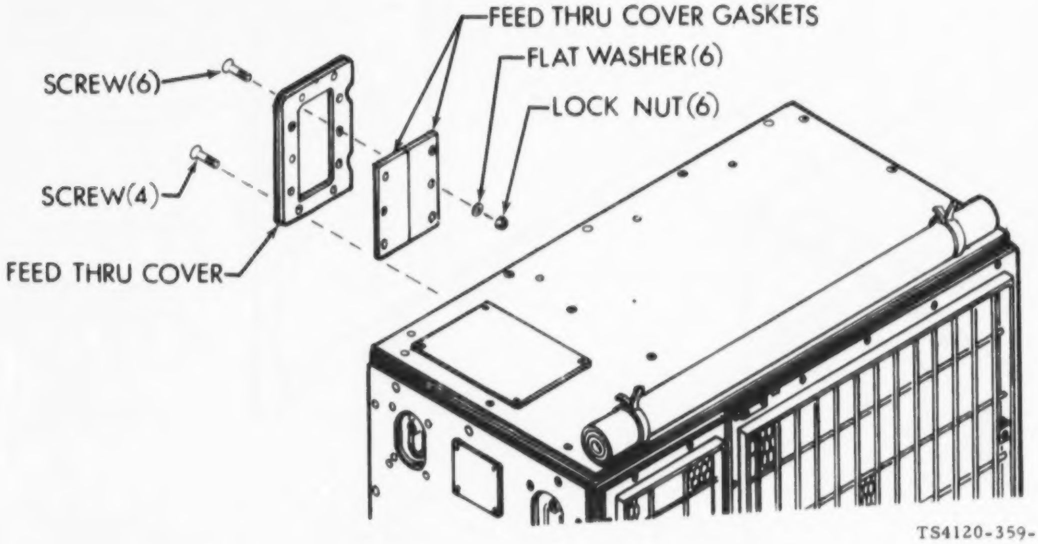

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Figure 3-16. Feed Thru Cover

a. Removal

(1) Using screwdriver, remove four screws from top and bottom flanges.

(2) Carefully remove the cover from the air conditioner.

(3) Using screwdriver, socket, and ratchet, remove the six crews, flat washers, and lock nuts.

(4) Carefully remove the two feed thru cover gaskets from the feed thru cover.

b. Inspection

(1) Check that the feed thru cover is not bent, cracked, or punctured. Replace if damaged.

(2) Check that the two feed thru cover gaskets are not worn, punctured, or torn. Replace if damaged.

(3) Check that the EMI and other gaskets are not cracked, loose, or missing

(4) Refer replacement/repair of gaskets to direct support.

c. Installation

(1) Using a screwdriver, socket, and ratchet, attach the two feed thru cover gaskets. Use six screws, flat washers, and lock nuts.

(2) Line up the holes in the feed thru cover and the air conditioner housing.

(3) Using screwdriver, install cover with four screws.

Follow-on Procedures: 1. Reconnect evaporator and condenser section assemblies (Direct Support).

2. Install air conditioner on shelter. (See paragraph 3-6.)

3-23. FRONT CONDENSER COVER

Preliminary Procedures: 1. Remove air conditioner from shelter. (See paragraph 3-6.)

2. Separate evaporator and condenser section assemblies. (Direct Support)

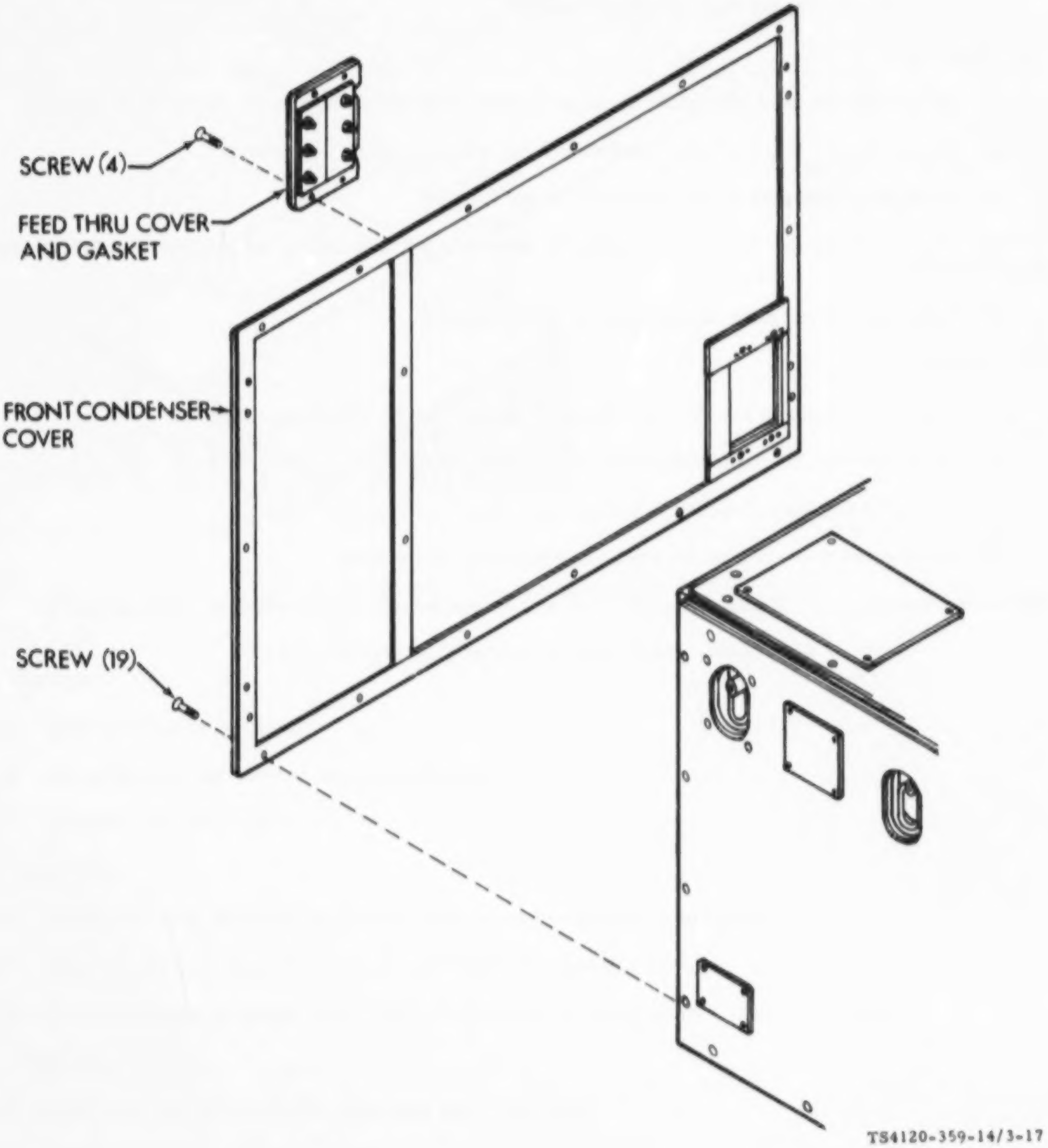


Figure 3-17. Front Condenser Cover

a. Removal

(1) Using screwdriver, remove four screws from the top and bottom flanges of the feed thru cover.

(2) Carefully remove the feed thru cover.

(3) Using screwdriver, remove nineteen screws from the front condenser cover.

(4) Carefully remove the front condenser cover.

b. Inspection

(1) Check that the front condenser cover is not bent, cracked, or punctured. Replace if damaged.

(2) Check that the EMI and other gaskets are not cracked, loose, or missing.

(3) Refer replacement/repair of gaskets to direct support.

(4) Check that the four floating nut plates for attaching the feed thru cover are securely riveted and in good condition.

(5) Refer floating nut plate replacement to direct support.

c. Installation

(1) Line up the holes in the front condenser cover and the air conditioner housing.

(2) Using screwdriver, install the cover with nineteen screws.

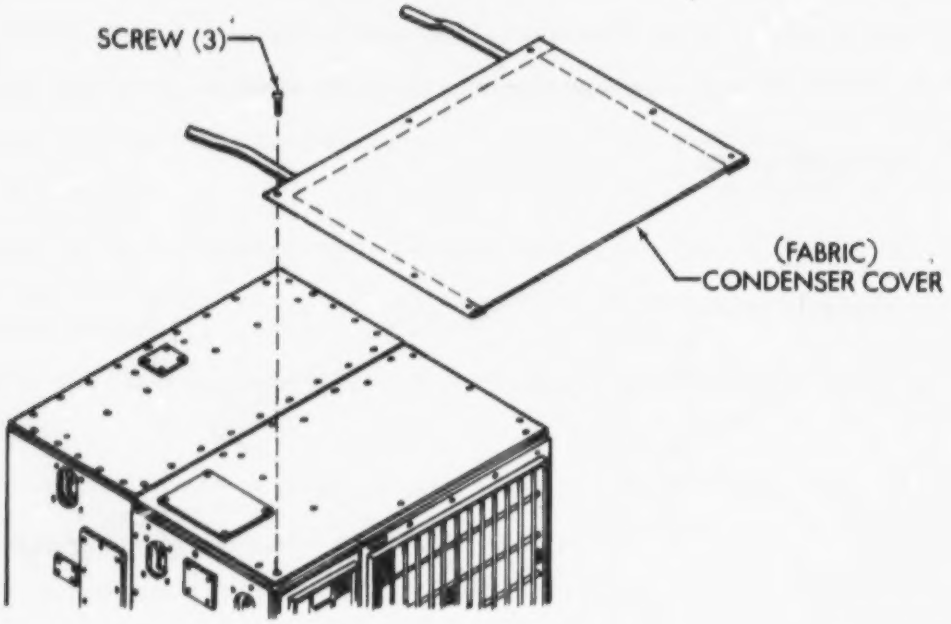
(3) Line up the holes in the feed thru cover and the front condenser cover.

(4) Using screwdriver, install the feed thru cover with four screws.

Follow-on Procedures: 1. Reconnect evaporator and condenser section assemblies (Direct Support).

2. Install air conditioner on shelter. (See paragraph 3-6.)

3-24. CONDENSER COVER



TS4120-359-14/3-18

Figure 3-18. Condenser Cover

a. Removal

(1) Untie and roll cover down.

(2) Using screwdriver, remove the three screws.

(3) Carefully remove cover.

b. Inspection

(1) Check for tears, missing ties, worn edges, or holes. Replace if damaged.

(2) Check for accumulated dirt and mildew. Clean if necessary.

(3) Check condition of snaps. Refer snap replacement to direct support. (See paragraph 4-56.)

c. Cleaning

(1) Wash with a solution of mild detergent and clear water.

(2) Rinse thoroughly with clear water.

(3) Dry prior to installation.

d. Installation

(1) Line up screw holes in cover and air conditioner housing.

(2) Using screwdriver, install cover with three screws.

(3) Roll cover up and tie both ties if unit is to be operational.

If unit is to be placed in storage, leave cover rolled down and snap in place.

3-25. TOP CONDENSER COVER

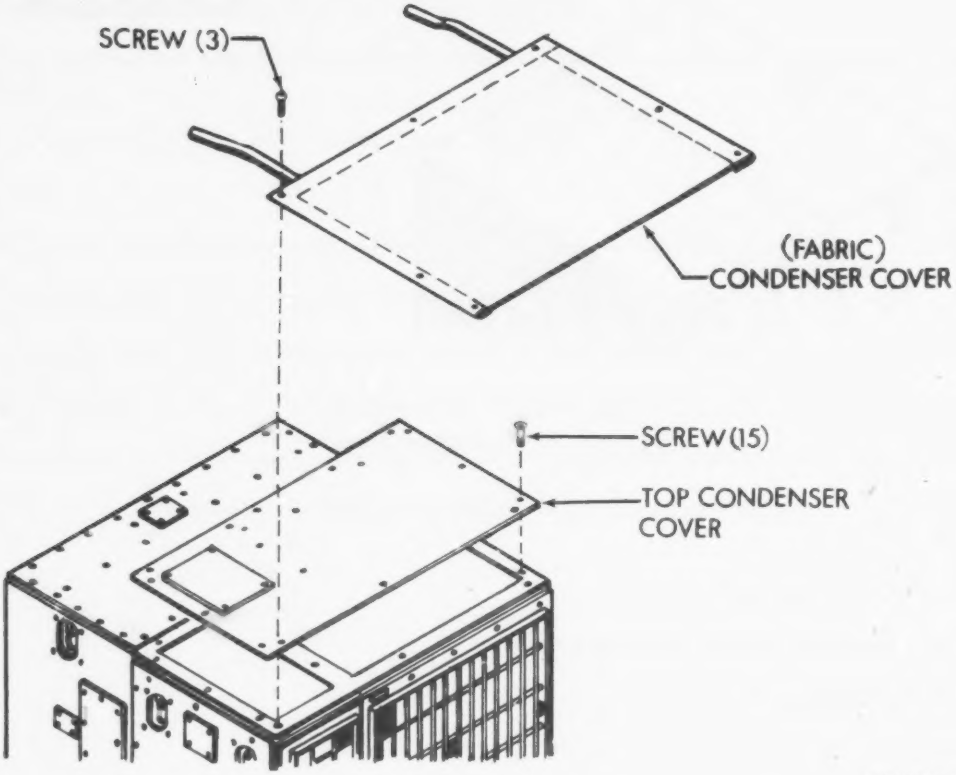


Figure 3-19. Top Condenser Cover

a. Removal

WARNING

Disconnect electrical power prior to removing outside covers. Turning unit off at control module does not disconnect power to air conditioner.

(1) Turn air conditioner off at circuit breaker, and disconnect power cable at washboard.

(2) Untie condenser fabric cover and roll it down.

(3) Using screwdriver, remove three screws.

(4) Carefully remove the condenser fabric cover.

(5) Using screwdriver, remove fifteen screws from top condenser cover.

(6) Carefully remove the top condenser cover.

b. Inspection

(1) Check that the top condenser cover is not bent, cracked, or punctured. Replace if damaged.

(2) Check that the EMI and other gaskets are not cracked, loose, or missing. Refer repair/replacement of gaskets to direct support.

(3) Check that information plate is readable and in place. Refer replacement to direct support.

c. Installation

(1) Line up screw holes in top condenser cover and air conditioner housing.

(2) Using screwdriver, install cover with fifteen screws.

(3) Line up screw holes in condenser fabric cover and housing.

(4) Using screwdriver, install condenser fabric cover with three screws.

(5) Roll cover up and tie with both ties if unit is to be operational. If unit is to be placed in storage, leave cover rolled down and snap in place.

(6) Connect power cable at washboard and turn air conditioner circuit breaker on.

3-26. RIGHT END CONDENSER COVER

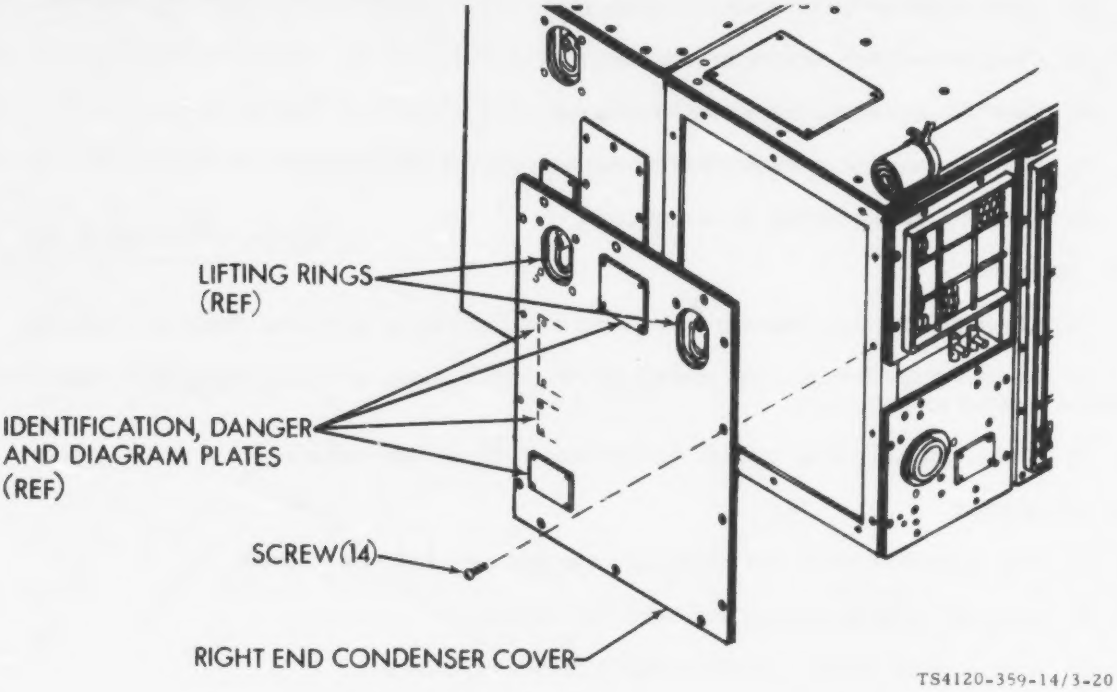


Figure 3-20. Right End Condenser Cover

a. Removal

WARNING

Disconnect electrical power prior to removing outside covers. Turning unit off at control module does not disconnect power to air conditioner.

(1) Turn air conditioner off at circuit breaker and disconnect power cable at washboard.

(2) Using screwdriver, remove fourteen screws.

(3) Carefully remove the right end condenser cover.

b. Inspection

(1) Check that cover is not bent, cracked, or punctured. Replace if damaged.

(2) Check that EMI gaskets are not cracked, loose, or missing. Refer gasket repair/replacement to direct support.

(3) Check that identification, danger, and diagram plates are readable and in place. Refer replacement to direct support.

(4) Check that the two lifting rings are securely attached and in good condition. Refer replacement to direct support.

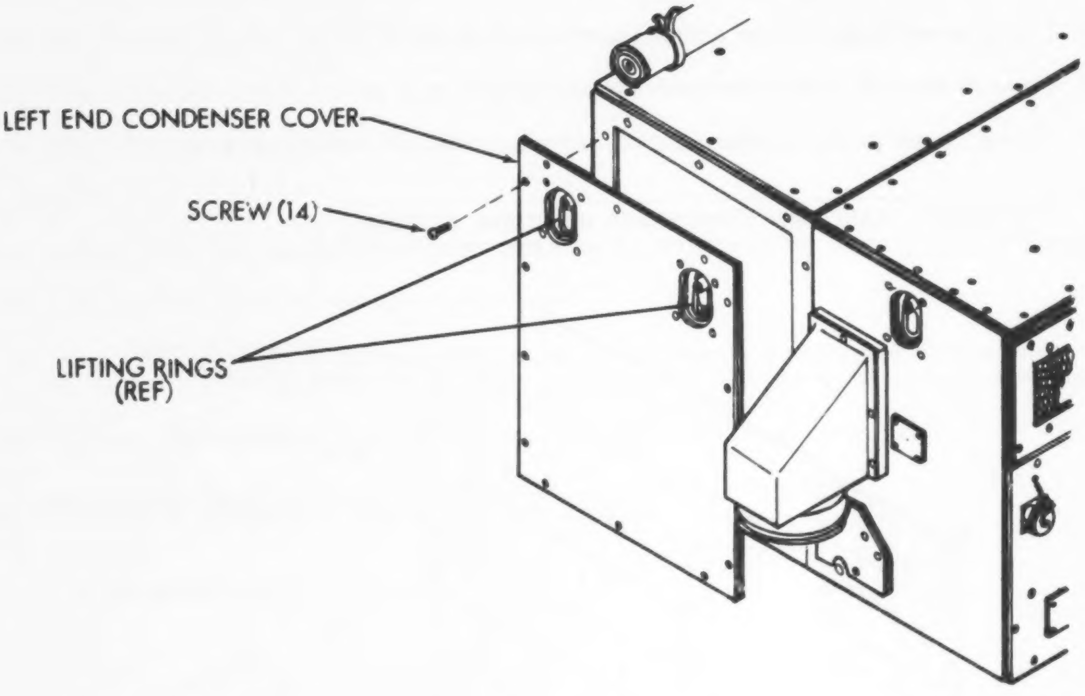
c. Installation

(1) Line up screw holes in cover and air conditioner housing.

(2) Using screwdriver, install cover with fourteen screws.

(3) Connect power cable at washboard, and turn air conditioner circuit breaker on.

3-27. LEFT END CONDENSER COVER



TS4120-359-14/3-21

Figure 3-21. Left End Condenser Cover

a. Removal

WARNING

Disconnect electrical power prior to removing outside covers. Turning unit off at control module does not disconnect power to air conditioner.

(1) Turn air conditioner off at circuit breaker and disconnect power cable at washboard.

(2) Using screwdriver, remove fourteen screws.

(3) Carefully remove the left end condenser cover.

b. Inspection

(1) Check that cover is not bent, cracked, or punctured. Replace if damaged.

(2) Check that EMI gaskets are not cracked, loose, or missing. Refer gasket repair/replacement to direct support.

(3) Check that the two lifting rings are securely attached and in good condition. Refer replacement to direct support.

c. Installation

(1) Line up screw holes in cover and air conditioner housing.

(2) Using screwdriver, install cover with fourteen screws.

(3) Connect power cable at washboard, and turn air conditioner circuit breaker on.

3-28. CONDENSER GUARD AND CONDENSER INLET EMI SCREEN

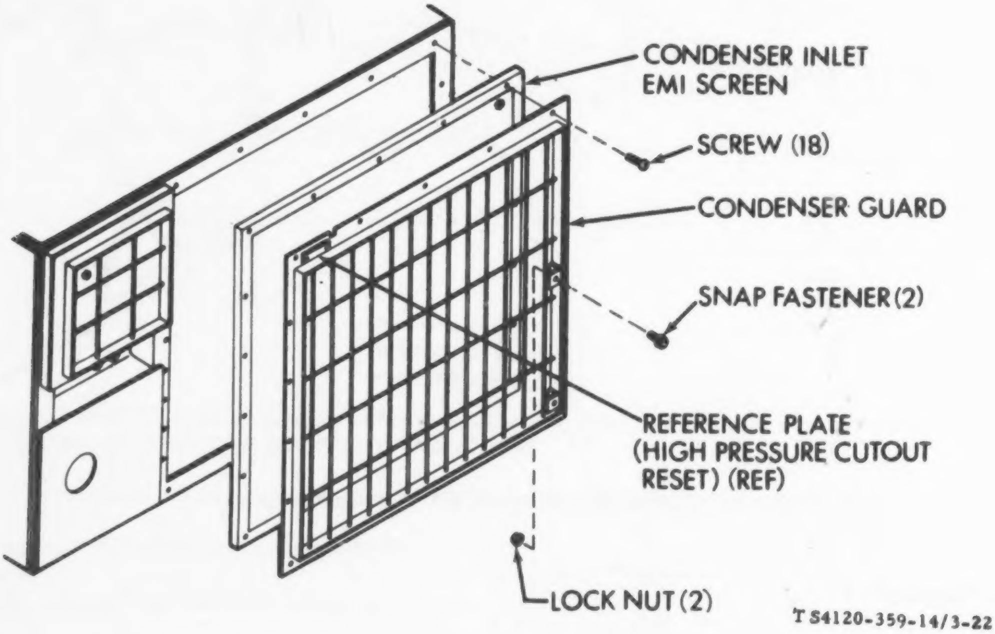

CONDENSER INLET EMI SCREEN
SCREW (18)
CONDENSER GUARD
SNAP FASTENER (2)
REFERENCE PLATE (HIGH PRESSURE CUTOUT RESET) (REF)
LOCK NUT (2)
TS4120-359-14/3-22

Figure 3-22. Condenser Guard and Condenser Inlet EMI Screen

a. Removal

WARNING

Disconnect electrical power prior to removing outside covers. Turning unit off at control module does not disconnect power to air conditioner.

(1) Turn air conditioner off at circuit breaker, and disconnect power cable at washboard.

(2) Using screwdriver, remove eighteen screws.

(3) Being careful not to damage EMI gasket and screen, lift the guard and EMI screen from the housing.

(4) Using screwdriver, socket, and ratchet, remove the two snap fasteners and lock nuts.

b. Inspection

(1) Check that condenser guard is not broken, dented, or otherwise damaged. Replace if damaged.

(2) Refer inspection and service of EMI screen to direct support.

(3) Check that snap fasteners are in good condition. Replace if damaged.

(4) Check that reference plate is readable and in place. Refer replacement to direct support.

c. Installation

(1) Using screwdriver, socket, and ratchet, install the two snap fasteners and secure with lock nuts.

(2) Line up screw holes in guard and EMI screen.

(3) Using screwdriver, install guard and EMI screen with eighteen screws. Be sure that they are tightened evenly, and that there are no gaps between the guard and the EMI screen or the EMI screen and the housing.

(4) Connect power cable at washboard and turn air conditioner circuit breaker on.

3-29. CONDENSER DISCHARGE GRILLE AND EMI SCREEN

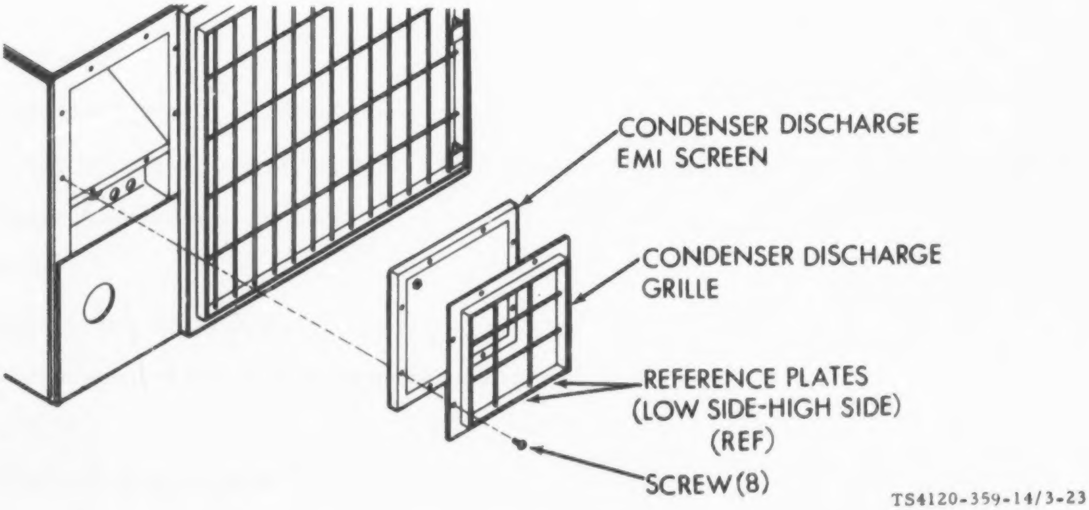

CONDENSER DISCHARGE EMI SCREEN
CONDENSER DISCHARGE GRILLE
REFERENCE PLATES (LOW SIDE-HIGH SIDE) (REF)
SCREW(8)
TS4120-359-14/3-23

Figure 3-23. Condenser Discharge Grilles and EMI Screen

a. Removal

WARNING

Disconnect electrical power prior to removing outside covers. Turning unit off at control module does not disconnect power to air conditioner.

(1) Turn air conditioner off at circuit breaker, and disconnect power cable at washboard.

(2) Using screwdriver, remove eight screws.

(3) Being careful not do damage EMI gasket and screen, lift the grille and EMI screen from the housing.

b. Inspection

(1) Check that condenser grille is not broken, dented, or otherwise damaged. Replace if damaged.

(2) Refer inspection and service of EMI screen to direct support.

(3) Check that reference plates are readable and in place. Refer replacement to direct support.

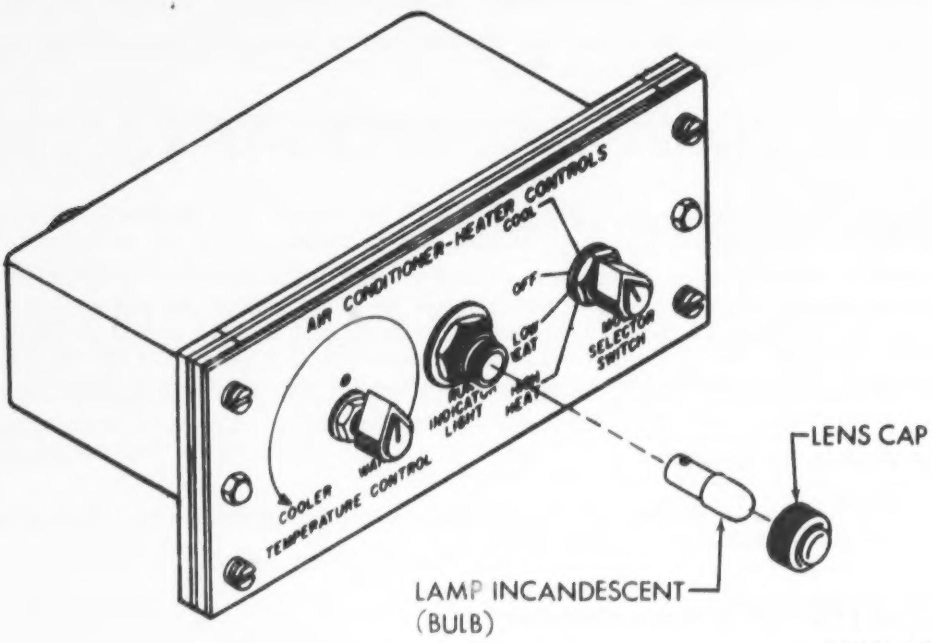
c. Installation

(1) Line up screw holes in grille and EMI screen.

(2) Using screwdriver, install grille and EMI screen with eight screws. Be sure that they are tightened evenly, and that there are no gaps between the grille and the EMI screen or the EMI screen and the housing.

(3) Connect power cable at washboard, and turn air conditioner circuit breaker on.

3-30. BULB REPLACEMENT FOR RUN INDICATOR LIGHT



TS4120-359-14/3-24

Figure 3-24. Bulb Replacement for Run Indicator Light

a. Inspection/Test

(1) Lamp should light in all operating modes.

(2) Lamp may be tested with MODE SELECTOR SWITCH IN OFF POSITION. Push in. Lamp should light.

(3) Replace bulb if it does not light.

b. Removal

(1) Unscrew and remove lens cap.

(2) Push in and turn bulb counterclockwise to remove it.

c. Installation

(1) Place bulb in light fixture.

(2) Push in and turn bulb clockwise to engage mounting pins.

(3) Screw lens cap in place.

Section VI PREPARATION FOR STORAGE OR SHIPMENT

3-31. GENERAL

a. See paragraph 3-6 for removal instructions.

b. Condenser cover should be untied, unrolled over back of condenser assembly and secured with snap fasteners to protect openings, valves, and meter.

c. Condensate drains (2), one each side, should be cleaned out with gage brush. They should be plugged with original pipe plugs, if available, or covered with tape to prevent entrance of foreign objects and insects.

3-32. ADMINISTRATIVE STORAGE OF EQUIPMENT

See TM 740-90-1. Administrative storage is short term storage — 1 to 45 days. It covers storage of equipment which can be readied for mission performance within 24 hours. Before placing an item in administrative storage, the next scheduled preventive maintenance checks and services should be performed, all known deficiencies corrected, and all current modification work orders applied. The administrative storage site should provide required protection from the elements and allow access for visual inspection when applicable.

3-33. INTERMEDIATE STORAGE

Storage of 46 to 180 days. No special handling is required other than protection from damage and the elements. Place the air conditioner in a dry, covered area.

3-34. LONG-TERM OR FLYABLE STORAGE

There is no time limit for this type of storage.

a. Bolt the air conditioner to a wood skid base. If the original shipping skid base was kept, use it. If not, fabricate a new one.

b. Wrap the air conditioner with two layers of heavy plastic sheet or barrier paper.

c. Tape and strap the wrapping in place.

d. Mark the air conditioner per standard Army Procedures.

CHAPTER 4

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

4-1. GENERAL

a. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

b. Test, maintenance, and diagnostic equipment (TMDE) and support equipment include electrical test equipment, standard pressure and vacuum gages, vacuum pumps and charging manifolds found as standard equipment in any direct support refrigeration shop.

c. Repair parts are listed and illustrated in the Repair Parts and Special Tools (RPSTL) list TM 5-4120-359-24P covering organizational, direct support, and general support maintenance for this equipment.

d. Tool Kit, Service, Refrigeration Unit, NSN 5180-00-597-1474, contains hand tools and equipment used for air conditioner maintenance. The following common items not contained in the refrigeration unit tool kit are also required for air conditioner maintenance.

Description	**National Stock Number**
Soldering	3439-00-930-1638
Vacuum Pump	4310-00-098-5272
Installation Tool (Captive Screws) — Maintenance, Set 18,000 BTUH Split-Pack Air Conditioner (97403) 13225E8259	5120-01-015-1422

Section II TROUBLESHOOTING

4-2. USE OF TROUBLESHOOTING TABLE

Table 4-1 contains troubleshooting information useful to direct support maintenance technicians in diagnosing and correcting malfunctions or unsatisfactory operation of the air conditioner.

a. The troubleshooting table lists the common malfunction symptoms and unsatisfactory performance characteristics technicians are most likely to encounter; test and inspection steps to be followed to determine the cause; and the corrective action(s) that should be performed for each cause listed.

b. First find the malfunction symptom or unsatisfactory performance characteristic in the table which most closely describes the immediate situation; then perform the test and inspections, and corrective action steps in the order in which they are listed.

WARNING

Disconnect input power before performing internal electrical troubleshooting. Voltages used can be lethal.

Table 4-1. TROUBLESHOOTING

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. AIR CONDITIONER WILL NOT START IN ANY MODE

Step 1. Press run indicator light.
If light illuminates, go to step 6.
Step 2. Check to see if air conditioner power circuit breaker in shelter has been turned off or tripped.
Reset circuit breaker.
Step 3. Check to see if power cable to air conditioner has been disconnected.
Connect power cable.
Step 4. Check to see if remote control cable has been disconnected.
Connect remote control cable.

CAUTION

Provided that military operational considerations allow the time, it is desirable, if the power has been disconnected for an unknown period of time, to wait six hours after reconnection before starting in the COOL mode. (See the caution in table 3-1, page 3-18.)

Table 4-1. TROUBLESHOOTING (cont.)

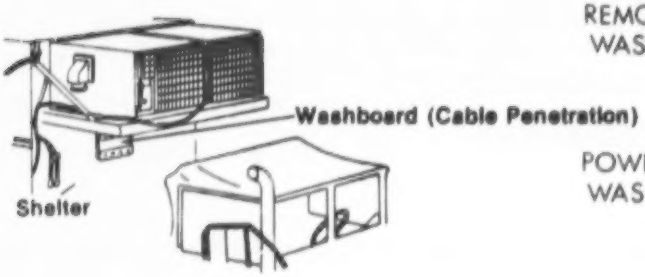
MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 5. Check that AC power is being supplied.

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

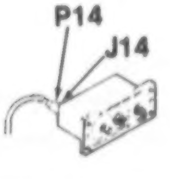
(a) Disconnect power cable at washboard connector on front of shelter.


Washboard (Cable Penetration)
Shelter
REMOTE CONTROL CABLE IDENTIFICATION AT WASHBOARD
(W86-P1 CURBSIDE CABLE)
(W88-P1 ROADSIDE CABLE)
POWER CABLE IDENTIFICATION AT WASHBOARD
(W22-P1 CURBSIDE CABLE)
(W21-P1 ROADSIDE CABLE)

TS4120-359-14/T4-1-1

(b) Apply power.
(c) Trip and reset circuit breaker.
(d) Check for nominal 208 Vac between pins AB, AC, BC of washboard connector.
If 197 to 229 Vac is not present in all three phases, refer problem to shelter maintenance personnel.

Step 6. Check thermal protector circuit of switch S6 (in evaporator blower motor B3).
(a) Remove power.
(b) Measure resistance between connector contacts B and N of remote cable at washboard or P 14 behind remote control assembly.



Remote Control Assembly

TS4120-359-14/T4-1-2

Table 4-1. TROUBLESHOOTING (cont.)

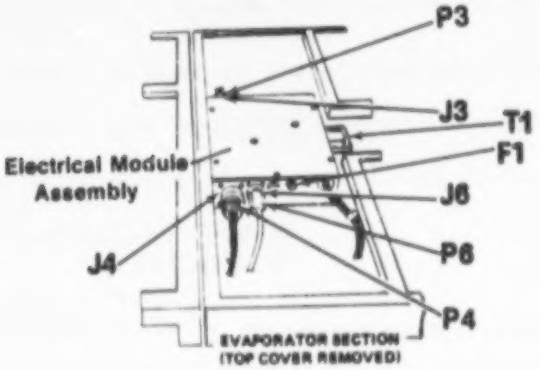
MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

(c) If resistance is less than two ohms, go to step 7.

(d) If resistance is two ohms or more, measure resistance at motor connector P6, pins E and F.


P3
J3
T1
F1
Electrical Module Assembly
J6
P6
J4
P4
EVAPORATOR SECTION (TOP COVER REMOVED)

TS4120-359-14/T4-1-3

(e) If resistance is less than two ohms, use wiring diagram figure 4-3 to locate defective remote cable or wiring.

Repair or replace defective remote cable or wiring.

(f) If resistance is two ohms or more.

Replace evaporator blower motor.

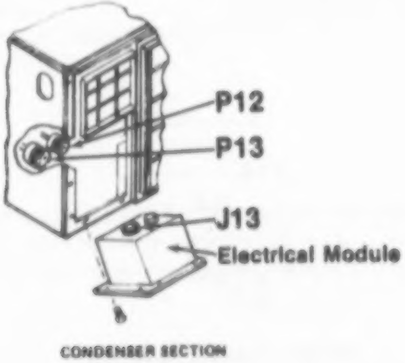
Step 7. Check mode selector switch (See paragraph 4-103.)

Replace if defective.

Step 8. Check power input to condenser.

(a) Remove power.

(b) Remove electrical module from condenser section.



TS4120-359-14/T4-1-4

Table 4-1. TROUBLESHOOTING (cont.)

MALFUNCTION
  TEST OR INSPECTION
    CORRECTIVE ACTION

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

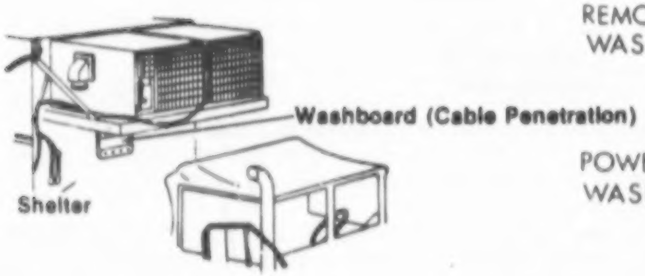
(c) Apply power.
(d) Test for 208 Vac between P12 pins:
  D and E
  D and F
  E and F
(e) If 197 to 229 Vac is present in all three phases, go to step 9.
(f) If not, use electrical schematic (figure 4-2) or wiring diagram (figure 4-3), to locate defect. Repair or replace defects as indicated.

Step 9. Check DC voltage output.
(a) Make sure all connections have been restored.
(b) Apply power.

WARNING

The following test must be conducted with power on. Exercise extreme caution.

(c) Check for voltage between pins A and H of remote cable at washboard or P14.



REMOTE CONTROL CABLE IDENTIFICATION AT WASHBOARD
  (W86-P1 CURBSIDE CABLE)
  (W88-P1 ROADSIDE CABLE)

POWER CABLE IDENTIFICATION AT WASHBOARD
  (W22-P1 CURBSIDE CABLE)
  (W21-P1 ROADSIDE CABLE)

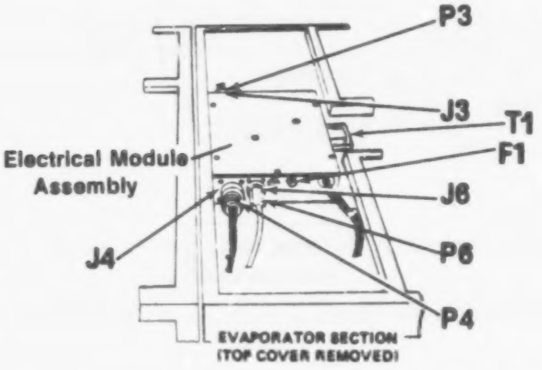
TS4120-359-14/T4-1-5

(d) If 25 to 31 Vdc is not indicated, go to steps 10 thru 12.

Table 4-1. TROUBLESHOOTING (cont.)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 10. Check electrical fuse F1.
(a) Remove power.
(b) Remove top cover, evaporator. (See para 3-21.)
(c) Remove fuse from fuseholder (on left side of electrical module assembly).
(d) Examine fuse and test for continuity.
Replace if bad.


P3
J3
T1
F1
Electrical Module Assembly
J6
P6
J4
P4
EVAPORATOR SECTION (TOP COVER REMOVED)

TS4120-359-14/T4-1-6

Step 11. Check transformer T1 output.

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

(a) Apply power.
(b) Measure ac voltage between T1-3 and T1-4.
(c) If 27 to 33 Vac is indicated, go to step 12.
(d) If not, check transformer input.
(e) If 197 to 229 Vac is indicated,
Replace transformer.
(f) If 197 to 229 Vac is not indicated, use electrical schematic (figure 4-2) or wiring diagram (figure 4-3) and locate defect.
Repair or replace defects as indicated.

Step 12. Check rectifier CR1 and wiring harness.
(a) Disconnect P4 from J4 (left side of electrical module assembly).

Table 4-1. TROUBLESHOOTING (cont.)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

(b) Apply power.
(c) Measure voltage between J4 connector contacts A and H.
(d) If 25 to 31 Vdc is not indicated check rectifier CR1.
(e) Remove electrical module assembly (evaporator) top cover.
(f) Measure rectifier voltage output across pos (+) to neg (-) terminals.
(g) If 25 to 31 Vdc is not indicated, check ac input to rectifier.
(h) If 27 to 33 Vac is indicated,
Replace rectifier CR1.
(i) If 27 to 33 Vac is not indicated, turn power off and check individual wire leads.
Replace or repair as indicated.

Step 13. Check remote control assembly.
(a) Measure resistance between connector J14 pins in accordance with table in paragraph 4-103.b.
(b) If resistances are not as indicated on table, use electrical schematic (figure 4-2) or wiring diagram (figure 4-3) to locate defect.
Repair or replace as indicated.

2. INSUFFICIENT COOLING

Step 1. Check to see that MODE SELECTOR SWITCH is properly positioned.
Set switch to COOL.

Step 2. Check to see that TEMPERATURE CONTROL is set to COOLER position.
Set TEMPERATURE CONTROL to COOLER position.

Step 3. Inspect fresh and return air filters, for dirt or blockage.
Clean filter/remove blockage.

Step 4. Check that condenser air is not blocked.
Fabric condenser cover must be rolled up and tied. Remove any obstruction from condenser inlet or discharge.

Step 5. Check that high pressure cutout, reset is not tripped.
Press in to reset.

Step 6. Check fresh air inlet for heat source.
Move all heat sources, over 50° F (10° C) above outside ambient, at least 10 feet from fresh air inlet.

Step 7. After 15 minutes of operation in COOL mode with TEMPERATURE CONTROL set to COOLER position, check sight glass. Refrigerant should be clear and center indicator should be green.
If refrigerant is milky or many bubbles are seen, leak test, repair and recharge as indicated. (See paragraph 4-8.) If center indicator is yellow evacuate and recharge (See paragraph 4-9.)

Step 8. Check refrigerant system.
(a) Measure ambient outside temperature.
(b) Apply power.
(c) Operate air conditioner in COOL mode with maximum COOLER temperature setting for at least 15 minutes.

Table 4-1. TROUBLESHOOTING (cont.)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

(d) Measure condenser discharge air temperature which should be 35° ± 5° F above ambient.
(e) Measure temperatures of air going into (return) and out of (discharge) evaporator section. Discharge should be 20° ± 5° F lower than return air temperature.

Step 9. Check liquid line solenoid valve L2 coil. (See paragraph 4-69.)
Replace coil only, if found bad.

Step 10. Check pressure equalizing solenoid valve L1 coil. (See paragraph 4-69.)
Replace coil only, if found bad.

Step 11. Check temperature control A1 (See paragraph 4-47.)
Replace if found bad.

Step 12. Check temperature sensing probe A1-RT (See paragraph 4-20.)
Replace if found bad.

Step 13. Check mode selector switch S1. (See paragraph 4-103.)
Replace if found bad.

Step 14. Check solenoid L2 valve body action. (See paragraph 4-69.)
Replace solenoid valve if found bad.

Step 15. Check solenoid L1 valve body action. (See paragraph 4-69.)
Replace solenoid valve if found bad.

Step 16. Check evaporator expansion valve. (See paragraph 4-36.)
Replace if found bad.

Step 17. Check for totally discharged refrigerant system. (See paragraph 4-11.)
Repair as indicated.

Step 18. Check time delay relay (K6). (See paragraph 4-96.)
Repair as indicated.

3. COOLING ACTION STOPS AFTER OPERATING A SHORT TIME

Step 1. Check that fabric condenser cover is rolled up and tied.
(1) Roll up cover and tie securely.
(2) Allow 30 minutes after compressor stops for pressure to drop to reset pressure.
(3) Manually reset high pressure switch (S4).

Step 2. Check outside covers on condenser section.
(a) Remove power.
(b) Inspect condenser section for loose, damaged, or missing covers and screws.
(1) Tighten loose screws.
(2) Install missing covers and screws.
(3) Repair or change damaged covers.
(4) Allow 30 minutes after compressor stops for pressure to drop to reset pressure.
(5) Manually reset high pressure switch (S4).
(6) Apply power.

Step 3. Check for blocked condenser EMI screens.
Remove blockage/clean EMI screens.

Step 4. Check operation of condenser discharge vanes. (See paragraph 4-60.)
Replace/repair parts as indicated.

Step 5. Check relay K2. (See paragraph 4-95.)
Replace if found bad.

4. INSUFFICIENT HEATING

Step 1. Check to see that MODE SELECTOR SWITCH is properly positioned.
Set switch to LOW HEAT or HIGH HEAT.

Table 4-1. TROUBLESHOOTING (cont.)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

During LOW HEAT operation only, one bank (nine) of the heaters are operational. These heaters are thermostatically controlled by the TEMPERATURE CONTROL. During HIGH HEAT operation an additional second bank (six) of heaters operate continuously.

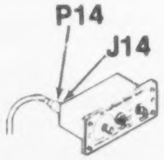
Step 2. Check that TEMPERATURE CONTROL is set to WARMER position.
Set TEMPERATURE CONTROL to WARMER position.
Step 3. Inspect fresh and return air filters for dirt or blockage.
Clean filter/remove blockage.
Step 4. Check thermostatic switches S2 and S3. (See paragraph 4-29.)
Replace if found bad.
Step 5. Check relays K4 and K5. (See paragraph 4-52.)
Replace if found bad.
Step 6. Check temperature control A1. (See paragraph 4-47.)
Replace if found bad.
Step 7. Check temperature sensing probe A1-RT. (See paragraph 4-20.)
Replace if found bad.
Step 8. Check mode selector switch S1. (See paragraph 4-103.)
Replace if found bad.
Step 9. Check heaters HR1-HR15. (See paragraph 4-31.)
Replace if found bad.

5. EVAPORATOR BLOWER MOTOR FAILS TO START.
(Compressor, condenser blower motor, and heaters start.)

Step 1. Check relay K3. (See paragraph 4-52.)
Replace if found bad.
Step 2. Check motor B3. (See paragraph 4-28.)
Replace if found bad.

6. COMPRESSOR FAILS TO START
(Condenser blower motor does not start, evaporator blower motor starts.)

Step 1. Check condenser safety circuit.
(a) Disconnect P14 connector.



Remote Control Assembly

TS4120-359-14/T4-1-7

Table 4-1. TROUBLESHOOTING (cont.)

MALFUNCTION

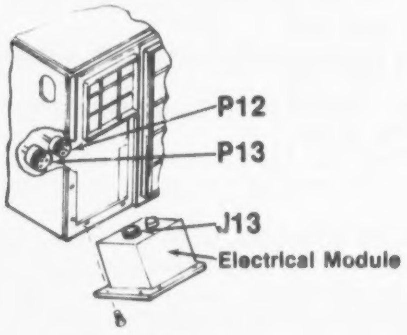
TEST OR INSPECTION

CORRECTIVE ACTION

(b) Check for continuity between P14 contacts D and H. Resistance should be between 20 and 50 ohms.
(c) If resistance is between 20 and 50 ohms, go to step 2.
(d) Apply power. (Mode selector set to COOL.)
(e) Press high pressure cutout reset on back of air conditioner.
(f) If condenser blower motor fails to start immediately and compressor fails to start within 60 seconds, remove power from air conditioner.
(g) Check continuity through S4. Resistance should be less than two ohms.
(h) If resistance is less than two ohms, go to step 3.
(i) Check system pressure at HIGH SIDE service valve.
(j) Allow time for pressure to drop below 305 psig and manually reset.

If S4 cannot be reset — replace switch S4.

Step 2. Check power to condenser electrical module.
(a) Remove electrical module, condenser.
(b) Disconnect P12 connector.



CONDENSER SECTION

TS4120-359-14/T4-1-8

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

(c) Apply power.
(d) Check voltage across P12 pins D and E, D and F, and E and F (should be 197 to 229 Vac).

Remove power. Using wiring diagram figure 4-3, continuity check circuit and repair or replace as indicated.

Step 3. Check low pressure switch S5.
(a) Check continuity through S5. Resistance should be less than two ohms.
(b) If it is less than two ohms, proceed to step 4.
(c) Check system pressure at LOW SIDE service valve.
(d) Switch S5 should automatically reset when pressure rises to 40 psig. Allow time for pressure to rise and switch to reset.

If S5 will not reset, replace it.

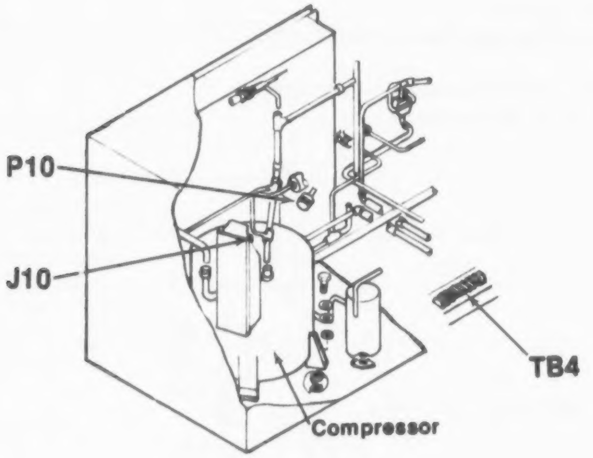
Table 4-1. TROUBLESHOOTING (cont.)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

Step 4. Check compressor motor thermal protector switch S8.
(a) Remove power.
(b) Disconnect P10 connector.

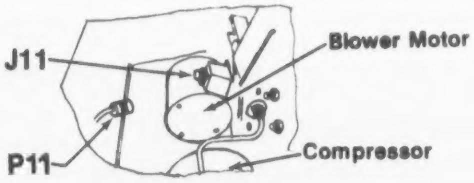


CONDENSER SECTION

TS4120-359-14/T4-1-9

(c) Test for continuity between J10 pins D and E. Resistance should be less than two ohms.
(d) If it is less than two ohms, go to step 5.
(e) Allow one hour for compressor to cool and switch S8 to reset.
If S8 resets, determine reason for compressor overheating. If S8 does not reset — change compressor.

Step 5. Check condenser blower motor thermal protector switch S7.
(a) Remove power.
(b) Disconnect P11 connector.



CONDENSER SECTION
(TOP COVER REMOVED)

TS4120-359-14/T4-1-10

Table 4-1. TROUBLESHOOTING (cont.)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

(c) Test for continuity between J11 pins E and F. Resistance should be less than two ohms.

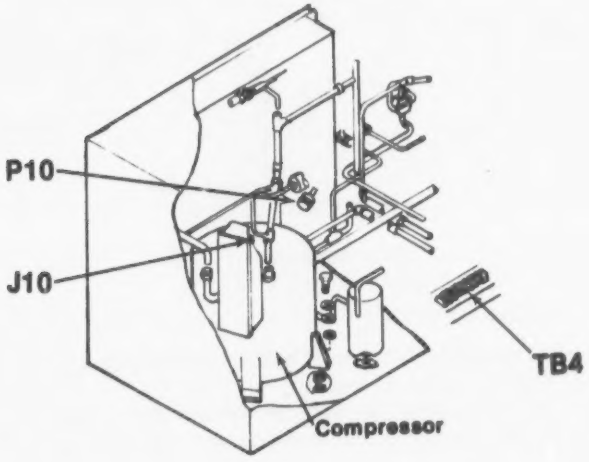
(d) Allow 3/4 hour for motor to cool and switch S7 to reset.

If S7 resets, determine reason for motor overheating. If S7 does not reset — replace the motor.

7. COMPRESSOR FAILS TO START
(Evaporator and condenser blower motors start.)

Step 1. Check for power at compressor P10 connector.

(a) Disconnect P10 connector.



CONDENSER SECTION

TS4120-359-14/T4-1-11

(b) Insert jumper between P10 pins D and E.

(c) Measure voltage across pins A and B, B and C, and A and C of P10 (allow for 60 second delay after turning selector switch to COOL mode and temperature control to maximum COOLER). Voltage should be 197 to 229 Vac.

(d) If voltage is 197 to 229 Vac, go to step 4; if not, go to step 2.

Step 2. Check time delay relay K6. (See paragraph 4-96.)

Replace if found bad.

Step 3. Check relay K1. (See paragraph 4-94.)

Replace if found bad.

Table 4-1. TROUBLESHOOTING (cont.)

MALFUNCTION
    TEST OR INSPECTION
        CORRECTIVE ACTION

Step 4. Check compressor motor B1 windings.
(a) Remove power.
(b) Measure resistance between connector J10 pins:
A and B
A and C
B and C
(c) Resistances should be greater than zero, but less than one ohm.
If not, replace compressor.

8. TEMPERATURE CONTROL NOT EFFECTIVE

Step 1. Check temperature control A1. (See paragraph 4-47.)
Replace if found bad.
Step 2. Check temperature sensing probe A1-RT. (See paragraph 4-20.)
Replace if found bad.
Step 3. Check mode selector switch. (See paragraph 4-103.)
Replace if found bad.
Step 4. Check wiring using wiring diagram figure 4-3.
Replace or repair as indicated.

9. UNUSUAL NOISE OR VIBRATION

Step 1. Examine air conditioner shock mounts and attaching hardware. Are shock mounts undamaged and firmly attached? Is air conditioner properly alined with shelter adapter duct?
(1) Remove power.
(2) Assure there is no contact between the air conditioner and metal portion of shelter adapter duct.
(3) Tighten loose screws.
(4) Install missing screws.
(5) Change defective shock mounts.
(6) Apply power.

Step 2. Examine fresh air duct, all covers, and attaching hardware. Are air ducts and covers undamaged and firmly attached to housing?
(1) Tighten loose screws.
(2) Install missing screws.
(3) Repair or change defective ducts and covers.
(4) Apply power.

Step 3. Check evaporator section.
(a) Remove power.
(b) Remove top cover, evaporator.
(c) Examine all parts and attaching hardware.
(d) Check blower impellers for interference or being out of round.
(e) Are parts firmly attached? Do impellers spin freely without wobble?
(1) Tighten loose screws.
(2) Install missing screws, clamps, and brackets.
(3) Adjust position of impellers until they spin freely.

Table 4-1. TROUBLESHOOTING (cont.)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

- (4) Change damaged parts.
- (5) Apply power.

Step 4. Check condenser section.

- (a) Remove Power.
- (b) Remove top cover, condenser.
- (c) Examine all parts and attaching hardware.
- (d) Check blower impeller for interference or being out of round.
- (e) Are parts firmly attached? Does impeller spin freely without wobble?
- (f) Check compressor mounting.
  - (1) Tighten loose screws.
  - (2) Install missing screws, clamps, and brackets.
  - (3) Adjust position of impeller until it spins freely.
  - (4) Change damaged parts.
  - (5) Apply power.

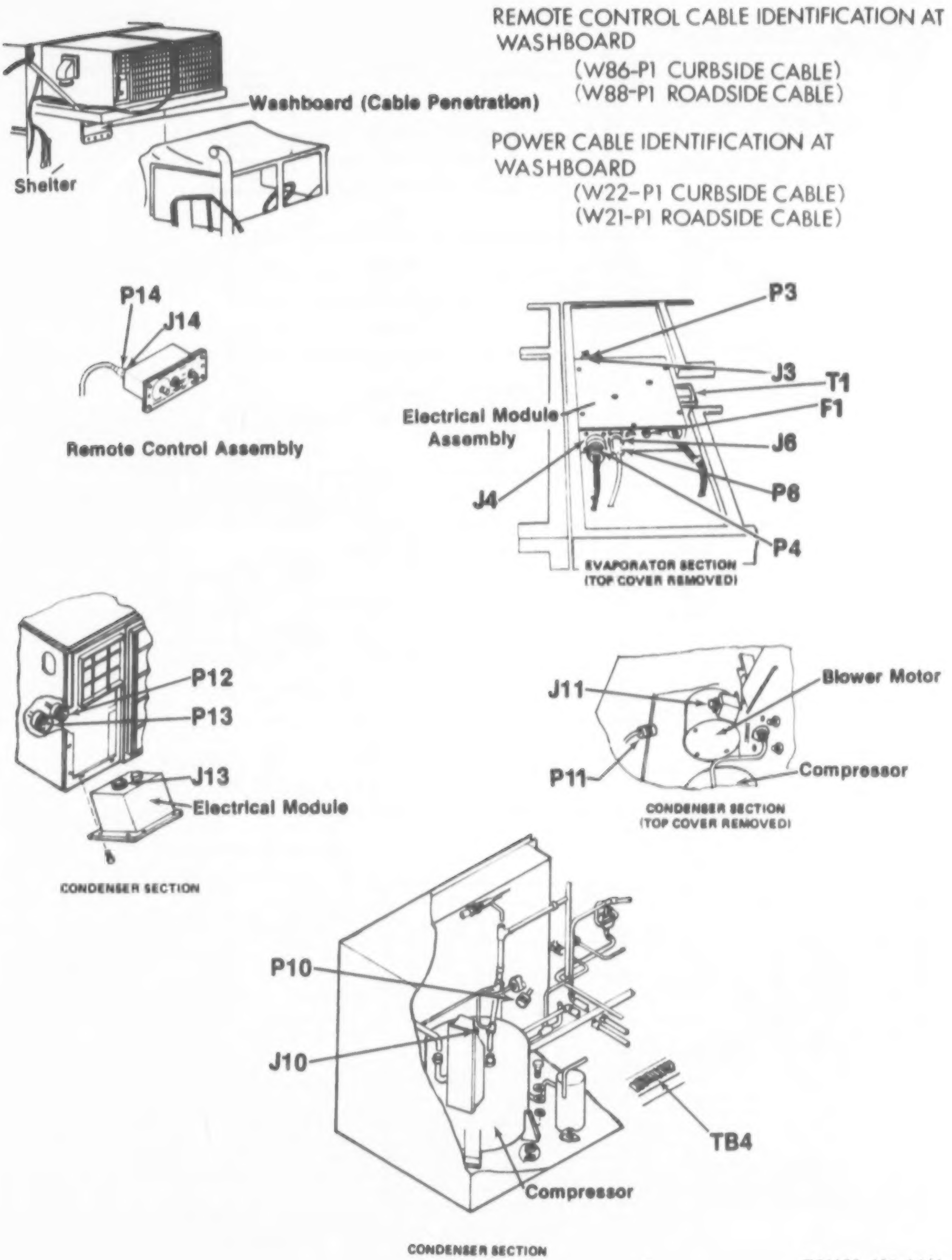
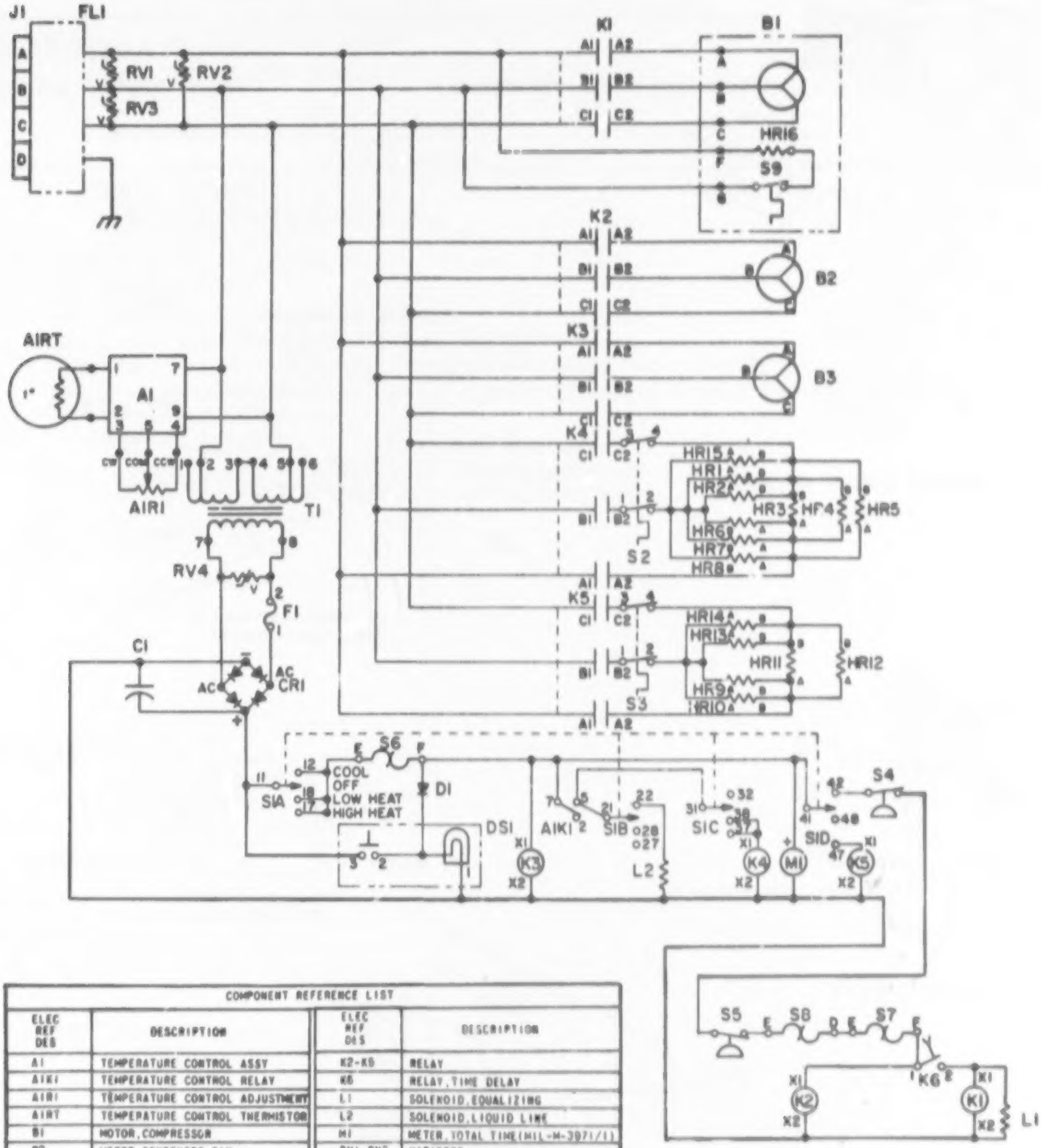


Figure 4-1. Location of Major Test Points and Connectors

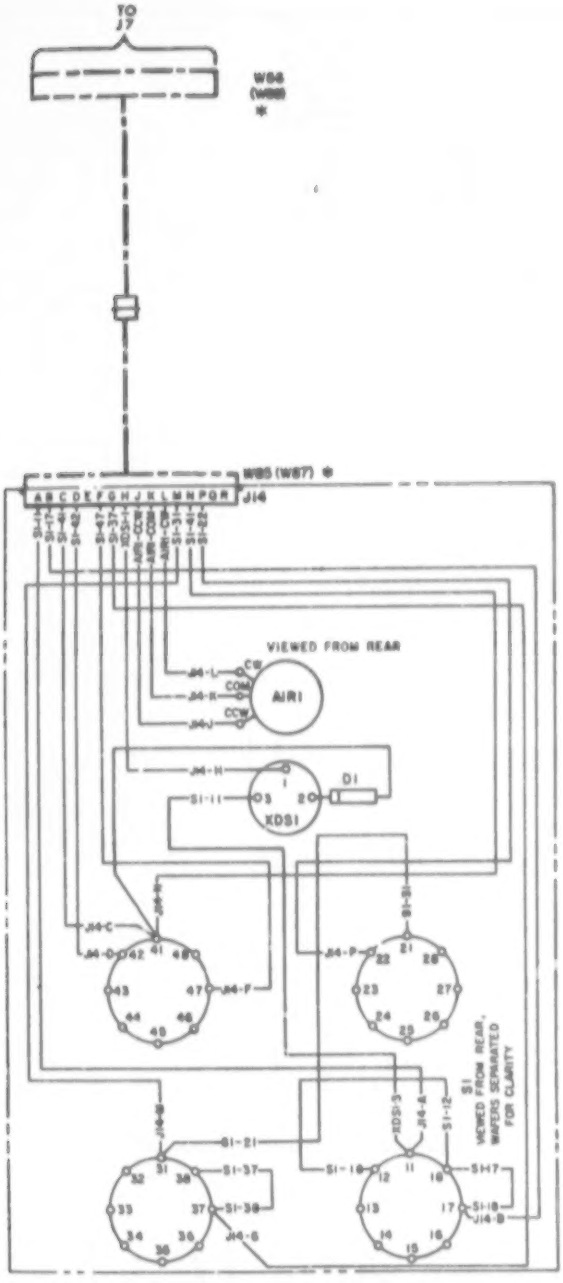


COMPONENT REFERENCE LIST

ELEC REF DES	DESCRIPTION	ELEC REF DES	DESCRIPTION
A1	TEMPERATURE CONTROL ASSY	K2-K5	RELAY
A1K1	TEMPERATURE CONTROL RELAY	K6	RELAY, TIME DELAY
A1R1	TEMPERATURE CONTROL ADJUSTMENT	L1	SOLENOID, EQUALIZING
A1RT	TEMPERATURE CONTROL THERMISTOR	L2	SOLENOID, LIQUID LINE
B1	MOTOR, COMPRESSOR	M1	METER, TOTAL TIME(MIL-M-3971/1)
B2	MOTOR, CONDENSER FAN	RV1-RV3	VARISTOR
B3	MOTOR, EVAPORATOR FAN	RV4	VARISTOR
C1	CAPACITOR, FILTER, MIL-C-39014/5	S1	SWITCH, SELECTOR
CR1	RECTIFIER	S2-S3	SWITCH, OVER HEAT PROTECTION
D1	DIODE	S4	SWITCH, HIGH PRESSURE
DS1	LAMP	S5	SWITCH, LOW PRESSURE
F1	FUSE	S6	SWITCH, THERMAL PROTECTOR
FL1	FILTER, RF	S7	SWITCH, THERMAL PROTECTOR
HR1-HR15	HEATER ELEMENTS	S8	SWITCH, THERMAL PROTECTOR
HR16	CRANKCASE HEATER	S9	SWITCH, CRANKCASE HEATER
J8	CONNECTOR, POWER INPUT	T1	TRANSFORMER
K1	RELAY		

TS4120-359-14/4-2

Figure 4-2. Electrical Schematic



* CABLE DESIGNATIONS SHOWN IN BRACKETS ARE IDENTICAL CABLES USED IN ALTERNATE INSTALLATION. REMOTE CABLE ASSEMBLIES W85, W86, W87, AND W88 ARE SUPPLIED BY THE USER AND ARE SHOWN FOR REFERENCE ONLY.

REMOTE CONTROL MODULE

COMPONENT REFERENCE LIST	
ELEC REF DES	DESCRIPTION
A1	TEMPERATURE CONTROL ASSY
A1-R1	TEMPERATURE CONTROL, ADJUSTMENT
A1-RT	TEMPERATURE CONTROL THERMISTOR
B1	MOTOR, COMPRESSOR
B2	MOTOR, CONDENSER FAN
B3	MOTOR, EVAPORATOR FAN
C1	CAPACITOR, FILTER
CR1	RECTIFIER
D1	DIODE
XDS1	LAMPHOLDER
E1-E3	GROUNDING SCREWS
XF1	FUSEHOLDER
HR1-HR15	HEATER ELEMENTS
J2	CONNECTOR, INTERFACE
J3	CONNECTOR, HEATERS
J4	CONNECTOR, EVAP CONTROL
J6	CONNECTOR, EVAP FAN
J7	CONNECTOR, EVAP CONTROL
J8	CONNECTOR, POWER
J9	CONNECTOR, INTERFACE
J10	CONNECTOR, COMPRESSOR
J11	CONNECTOR, CONDENSER FAN
J12	CONNECTOR, CONDENSER MODULE
J13	CONNECTOR, CONDENSER MODULE
J14	CONNECTOR, REMOTE MODULE
K1	RELAY
K2	RELAY
K3	RELAY
K4	RELAY
K5	RELAY
K6	RELAY, TIME DELAY
L1	VALVE, SOLENOID, EQUALIZING
L2	VALVE, SOLENOID, LIQUID LINE
M1	METER, TOTAL TIME
P2	CONNECTOR, EVAP-COND
P2A	CONNECTOR, EVAP-COND
P3	CONNECTOR, HEATERS
P4	CONNECTOR, EVAP, CONTROL
P6	CONNECTOR, EVAP FAN
P9	CONNECTOR, POWER
P9A	CONNECTOR, POWER
P10	CONNECTOR, COMPRESSOR
P11	CONNECTOR, CONDENSER FAN
P12	CONNECTOR, CONDENSER MODULE
P13	CONNECTOR, CONDENSER MODULE
RV1-RV3	VARISTOR
RV4	VARISTOR
S1	SWITCH, SELECTOR
S2, S3	SWITCH, OVER HEAT
S4	SWITCH, HIGH PRESSURE
S5	SWITCH, LOW PRESSURE
T1	TRANSFORMER
TB1	TERMINAL BOARD
TB2	TERMINAL BOARD
TB3	TERMINAL BOARD
TB4	TERMINAL BOARD
FL1	FILTER, RF
J1	CONNECTOR, POWER INPUT
P8	CONNECTOR, POWER
* W86(W88)	CABLE ASSY, REMOTE
* W85(W87)	CABLE ASSY, REMOTE

TS4120-359-14/4-3-1

Figure 4-3. Wiring Diagram (Sheet 1 of 3)

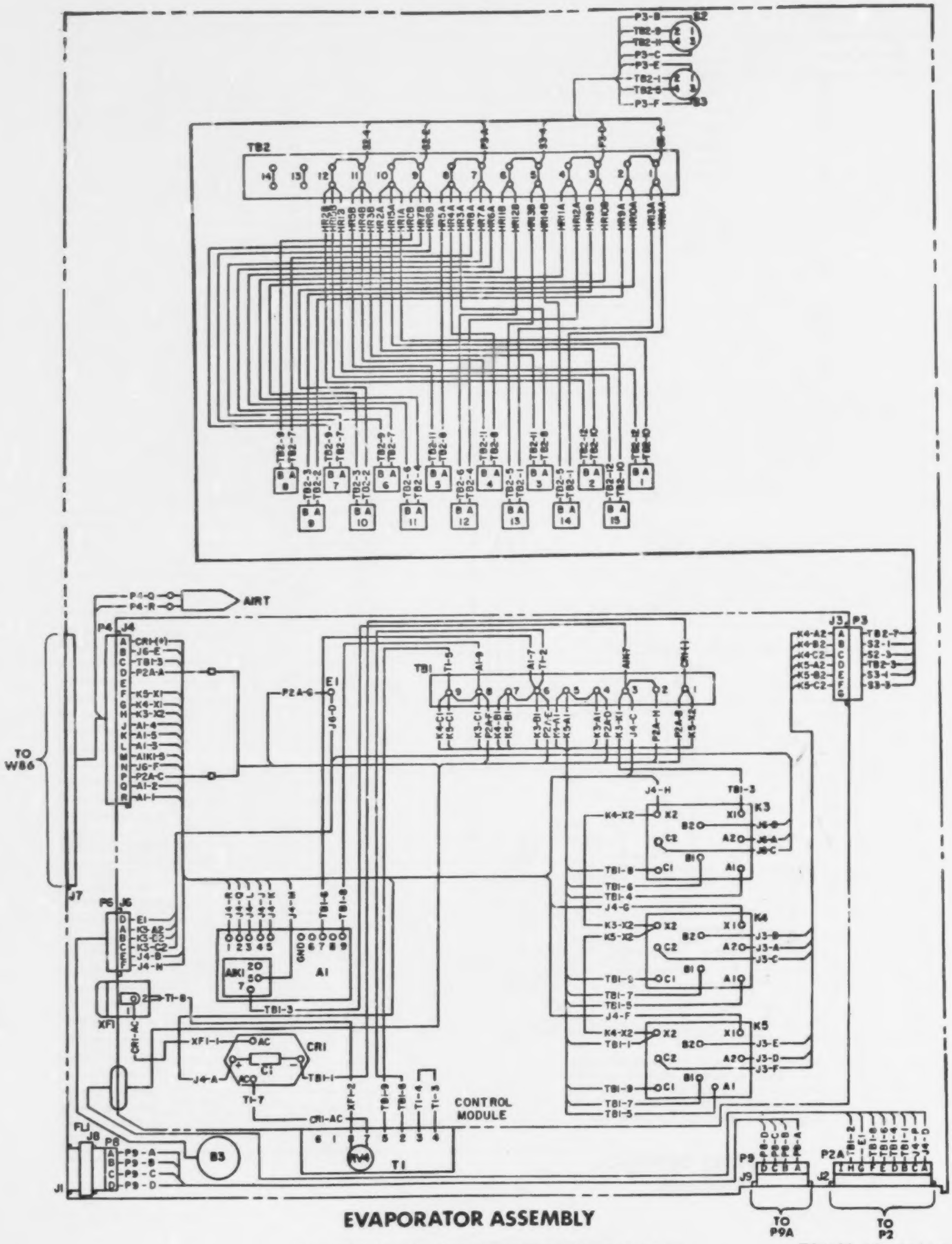
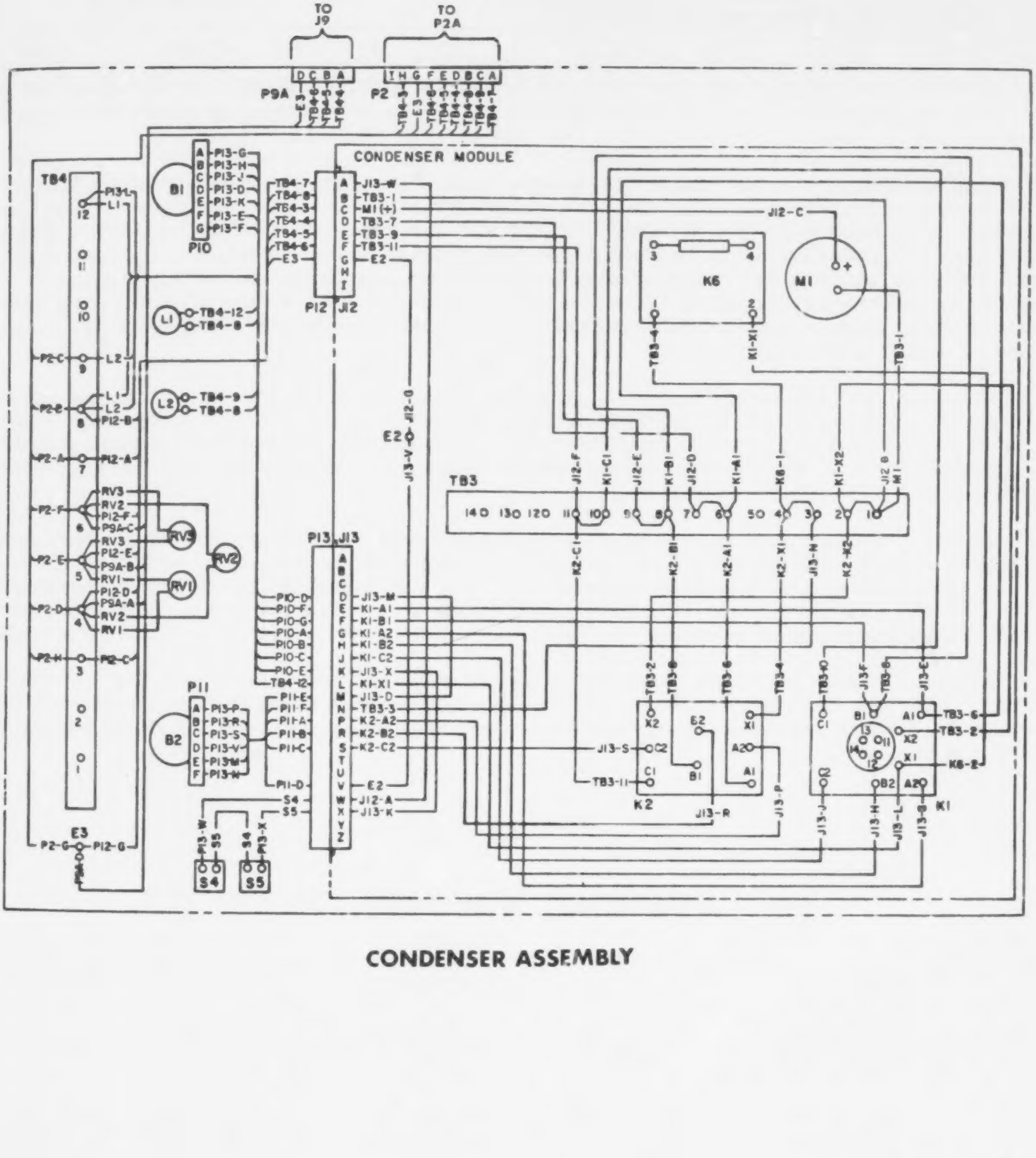


Figure 4-3. Wiring Diagram (Sheet 2 of 3)

TS4120-359-14/4-3-2



CONDENSER ASSEMBLY

TS4120-359-14/4-3-3

Figure 4-3. Wiring Diagram (Sheet 3 of 3)

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Section III GENERAL MAINTENANCE PROCEDURES

4-3. ELECTRICAL WIRING REPAIR GENERAL

Preferred repair methods consist of replacing wires, terminals, connectors, etc., rather than splicing wires, bending ends to form terminals, and other make-shift procedures; although the latter may be appropriate for emergency field repairs. Determine the proper size and length of wire, or the terminal, or connector to be used for replacement by referring to table 4-2, "Wire List", and to the wiring diagram (figure 4-3).

a. Soldering Connections. Wire connections must be made mechanically sound before they are soldered; solder alone does not provide sufficient strength to prevent breakage. Joining surfaces of connections to be soldered must be clean and bright. If a separate flux is used, it should conform to Specification MIL-F-4995, Type I, rosin-alcohol flux, and should be brushed onto the joint before soldering. If a flux-core solder is used, it should always be rosin-core electrical solder. If an uncored solder is used, it should be a lead-tin solder, item 1 Appendix E, conforming to Specification QQ-S-571. Wires should always be heated to the point at which the solder will melt completely and flow into all parts of the joint. Excessive build-up of solder "gobs" on the joint should be avoided or removed.

b. Insulating Joints. The preferred method of insulating electrical joints is by the use of heat-shrink tubing. To apply, cut a piece of heat-shrink tubing of suitable diameter to a one-inch length for covering joints at terminals or connectors, or to a length about 1/2 inch (1.3 cm) longer than the joint to be insulated, and slide the tubing over the wire before making the joint. After the joint is made, slide the tubing so that it covers the joint, and shrink in place with moderate heat.

c. Splicing Wires. To repair broken or cut wires that are otherwise sound, the mating ends can be stripped and spliced. A commercial butt splice can be crimped onto the ends to join them, or a "Western Union" wire splice can be made. The latter is made by stripping 1/4 - 1/2 inch (0.6 - 1.3 cm) of insulation from the wire ends, holding the ends parallel and facing opposite directions, then twisting each end around the other wire at least three turns. Solder and apply insulation as described above.

d. Crimping Terminals. To install a terminal on the end of a wire, strip 1/4 - 1/2 inch (0.6 - 1.3 cm) of insulation from the end of the wire, apply a one-inch piece of heat-shrink tubing (if the terminals are of the uninsulated type), and insert wire end into the shank of the terminal. Crimp the shank, and install heat-shrink tubing, if necessary.

TABLE 4-2. WIRE LIST

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN.	CM
	WIRING HARNESS		P2			
P2-A	MS3106R24-11S	TB4-7	MS17143-2	16	41	104.1
P2-B	MS3106R24-11S	TB4-8	MS17143-2	16	41	104.1
P2-C	MS3106R24-11S	TB4-9	MS17143-2	16	41	104.1
P2-D	MS3106R24-11S	TB4-4	MS17143-3	12	39	99.1
P2-E	MS3106R24-11S	TB4-5	MS17143-3	12	39	99.1
P2-F	MS3106R24-11S	TB4-6	MS17143-3	12	39	99.1
P2-G	MS3106R24-11S	E3	MS25036-153	14	44	111.8
P2-H	MS3106R24-11S	TB4-3	MS17143-2	16	39	99.1

TABLE 4-2. WIRE LIST (cont)

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN.	CM
	WIRING HARNESS		P2A			
P2A-A	MS3106R24-11P	J4-D	13207E5347-2	16	35	88.9
P2A-B	MS3106R24-11P	TB1-1	MS25036-153	16	47	119.4
P2A-C	MS3106R24-11P	J4-P	13207E5347-2	16	34	86.4
P2A-D	MS3106R24-11P	TB1-4	MS25036-156	12	40	101.6
P2A-E	MS3106R24-11P	TB1-6	MS25036-156	12	42	106.7
P2A-F	MS3106R24-11P	TB1-8	MS25036-156	12	43	109.2
P2A-G	MS3106R24-11P	E1	MS25036-153	14	38	96.5
P2A-H	MS3106R24-11P	TB1-2	MS25036-153	16	47	119.4
	WIRING HARNESS		J3			
J3-A	MS3102R20-15S	K4-A2	MS25036-156	12	8	20.3
J3-B	MS3102R20-15S	K4-B2	MS25036-156	12	8	20.3
J3-C	MS3102R20-15S	K4-C2	MS25036-156	12	8	20.3
J3-D	MS3102R20-15S	K5-A2	MS25036-156	14	10	25.4
J3-E	MS3102R20-15S	K5-B2	MS25036-153	14	10	25.4
J3-F	MS3102R20-15S	K5-C2	MS25036-153	14	10	25.4
	WIRING HARNESS		P3			
P3-A	MS3106R20-15P	TB2-7	MS17143-15	12	41	104.2
P3-B	MS3106R20-15P	S2-1	MS25036-112	12	39	99.1
P3-C	MS3106R20-15P	S2-3	MS25036-112	12	39	99.1
P3-D	MS3106R20-15P	TB2-3	MS17143-14	14	40	100.3
P3-E	MS3106R20-15P	S3-1	MS25036-108	14	42	105.4
P3-F	MS3106R20-15P	S3-3	MS25036-108	14	42	105.4
S3-2	MS25036-108	TB2-1	MS17143-14	14	45	113.1
S3-4	MS25036-108	TB2-5	MS17143-14	14	46	116.8
S2-2	MS25036-112	TB2-9	MS17143-15	12	46	116.8
S2-4	MS25036-112	TB2-11	MS17143-15	12	46	116.8
	WIRING HARNESS		J4 and J6			
J4-A	MS3102R24-28S	CR1-(+)	——	16	16	40.6
J4-B	MS3102R24-28S	J6-E	MS3102R14S-6S	16	5	12.1
J4-C	MS3102R24-28S	TB1-3	MS25036-153	16	8	20.3
J4-Q	MS3102R24-28S	A1-2	13207E5347-2	16	7	17.8
J4-F	MS3102R24-28S	K5-X1	MS25036-106	16	13	33.0
J4-G	MS3102R24-28S	K4-X1	MS25036-106	16	12	29.4
J4-H	MS3102R24-28S	K3-X2	MS25036-106	16	12	29.4
J4-J	MS3102R24-28S	A1-4	13207E5347-2	16	6	15.2
J4-K	MS3102R24-28S	A1-5	13207E5347-2	16	6	15.2
J4-L	MS3102R24-28S	A1-3	13207E5347-2	16	6	15.2
J4-M	MS3102R24-28S	A1K1-5	13221E9123-1	16	8	20.3
J4-N	MS3102R24-28S	J6-F	MS3102R14S-6S	16	5	12.1
J4-R	MS3102R24-28S	A1-1	13207E5347-2	16	6	15.2
J4-D	MS3102R24-28S	P2A-A	13207E5347-2	16	5	11.4
J4-P	MS3102R24-28S	P2A-C	13207E5347-2	16	6	14.0
J6-A	MS3102R14S-6S	K3-A2	MS25036-153	16	10	25.4

TABLE 4-2. WIRE LIST (cont)

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN.	CM
J6-B	MS3102R14S-6S	K3-B2	MS25036-153	16	10	25.4
J6-C	MS3102R14S-6S	K3-C2	MS25036-153	16	10	25.4
J6-D	MS3102R14S-6S	E1	MS25036-153	16	6	15.2
	WIRING HARNESS		P4 to J7			
P4-A	MS3106R24-28P	J7-A	MS27508E20B16S	16	34	86.4
P4-B	MS3106R24-28P	J7-B	MS27508E20B16S	16	34	86.4
P4-C	MS3106R24-28P	J7-C	MS27508E20B16S	16	34	86.4
P4-D	MS3106R24-28P	J7-D	MS27508E20B16S	16	34	86.4
P4-F	MS3106R24-28P	J7-F	MS27508E20B16S	16	34	86.4
P4-G	MS3106R24-28P	J7-G	MS27508E20B16S	16	34	86.4
P4-H	MS3106R24-28P	J7-H	MS27508E20B16S	16	34	86.4
P4-J	MS3106R24-28P	J7-J	MS27508E20B16S	16	34	86.4
P4-K	MS3106R24-28P	J7-K	MS27508E20B16S	16	34	86.4
P4-L	MS3106R24-28P	J7-L	MS27508E20B16S	16	34	86.4
P4-M	MS3106R24-28P	J7-M	MS27508E20B16S	16	34	86.4
P4-N	MS3106R24-28P	J7-N	MS27508E20B16S	16	34	86.4
P4-P	MS3106R24-28P	J7-P	MS27508E20B16S	16	34	86.4
P4-Q	MS3106R24-28P	A1RT	13207E5347-1	18	31	78.7
P4-R	MS3106R24-28P	A1RT	13207E5347-1	18	31	78.7
	WIRING HARNESS		P8 to P9			
P8-A	MS3106R22-22P	P9-A	MS3106R22-22S	10	20	50.8
P8-B	MS3106R22-22P	P9-B	MS3106R22-22S	10	20	50.8
P8-C	MS3106R22-22P	P9-C	MS3105R22-22S	10	20	50.8
P8-D	MS3106R22-22P	P9-D	MS3106R22-22S	14	20	50.8
	WIRING HARNESS		P9A			
P9A-A	MS3106R22-22P	TB4-4	MS17143-3	10	38	95.3
P9A-B	MS3106R22-22P	TB4-5	MS17143-3	10	38	95.3
P9A-C	MS3106R22-22P	TB4-6	MS17143-3	10	38	95.3
P9A-D	MS3106R22-22P	E3	MS25036-153	14	38	95.3
	WIRING HARNESS		P10, P11, and P13			
P13-G	MS3106R32-13S	P10-A	MS3106R20-15S	12	47	119.4
P13-H	MS3106R32-13S	P10-B	MS3106R20-15S	12	47	119.4
P13-J	MS3106R32-13S	P10-C	MS3106R20-15S	12	47	119.4
P13-D	MS3106R32-13S	P10-D	MS3106R20-15S	16	47	119.4
P13-E	MS3106R32-13S	P10-F	MS3106R20-15S	16	47	119.4
P13-F	MS3106R32-13S	P10-G	MS3106R20-15S	16	47	119.4
P13-K	MS3106R32-13S	P10-E	MS3106R20-15S	16	47	119.4
P13-L	MS3106R32-13S	TB4-12	MS17143-2	16	26	66.1
P13-M	MS3106R32-13S	P11-E	MS3106R14S-6S	16	47	119.4
P13-N	MS3106R32-13S	P11-F	MS3106R14S-6S	16	47	119.4
P13-P	MS3106R32-13S	P11-A	MS3106R14S-6S	16	47	119.4
P13-R	MS3106R32-13S	P11-B	MS3106R14S-6S	16	47	119.4
P13-S	MS3106R32-13S	P11-C	MS3106R14S-6S	16	47	119.4

TABLE 4-2. WIRE LIST (cont)

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN.	CM
P13-V	MS3106R32-13S	P11-D	MS3106R14S-6S	16	47	119.4
P13-W	MS3106R32-13S	S4	MS25036-153	16	56	142.2
P13-X	MS3106R32-13S	S5	MS25036-153	16	56	142.2
L-1	13207E5347-2	TB4-8	MS17143-2	16	39	99.1
L-1	13207E5347-2	TB4-12	MS17143-2	16	39	99.1
L-2	13207E5347-2	TB4-8	MS17143-2	16	34	86.4
L-2	13207E5347-2	TB4-9	MS17143-2	16	34	86.4
	WIRING HARNESS		P12			
P12-A	MS3106R24-11P	TB4-7	MS17143-2	16	21	53.4
P12-B	MS3106R24-11P	TB4-8	MS17143-2	16	21	53.4
P12-D	MS3106R24-11P	TB4-4	MS17143-3	12	23	58.4
P12-E	MS3106R24-11P	TB4-5	MS17143-3	12	23	58.4
P12-F	MS3106R24-11P	TB4-6	MS17143-3	12	23	58.4
P12-G	MS3106R24-11P	E3	MS25036-153	16	26	66.1
P12-C	MS3106R24-11P	TB4-3	MS17143-2	16	23	58.4
	WIRING HARNESS		J12 and J13			
J13-G	MS3102R32-13P	K1-A2	MS25036-112	12	14	35.6
J13-H	MS3102R32-13P	K1-B2	MS25036-112	12	14	35.6
J13-J	MS3102R32-13P	K1-C2	MS25036-112	12	14	35.6
J13-D	MS3102R32-13P	J13-M	MS3102R32-13P	16	3	7.6
J13-E	MS3102R32-13P	K1-A1	MS25036-108	16	16	39.4
J13-F	MS3102R32-13P	K1-B1	MS25036-108	16	16	39.4
J13K	MS3102R32-13P	J13-X	MS3102R32-13P	16	3	7.6
J12-C	MS3102R24-11S	M1 (+)	13207E5347-2	16	15	38.1
J13-L	MS3102R32-13P	K1-X1	MS25036-106	16	14	35.6
J13-N	MS3102R32-13P	TB3-3	MS17143-14	16	13	33.0
J13-P	MS3102R32-13P	K2-A2	MS25036-153	16	13	33.0
J13-R	MS3102R32-13P	K2-B2	MS25036-153	16	13	33.0
J13-S	MS3102R32-13P	K2-C2	MS25036-153	16	13	33.0
J13-V	MS3102R32-13P	E2	MS25036-153	16	13	33.0
J13-W	MS3102R32-13P	J12-A	MS3102R24-11S	16	8	20.3
J12-B	MS3102R24-11S	TB3-1	MS17143-14	16	15	38.1
J12-D	MS3102R24-11S	TB3-7	MS17143-15	12	14	35.6
J12-E	MS3102R24-11S	TB3-9	MS14143-15	12	14	35.6
J12-F	MS3102R24-11S	TB3-11	MS17143-15	12	13	33.0
J12-G	MS3102R24-11S	E2	MS25036-153	16	15	38.1
	WIRING HARNESS		J14			
J14-A	MS27508E20B16P	S1-11	MS25036-106	16	10	25.4
J14-B	MS27508E20B16P	S1-17	MS25036-106	16	10	25.4
J14-C	MS27508E20B16P	S1-41	MS17143-15	16	10	25.4
J14-D	MS27508E20B16P	S1-42	MS25036-106	16	10	25.4
J14-F	MS27508E20B16P	S1-47	MS25036-106	16	10	25.4
J14-G	MS27508E20B16P	S1-37	MS25036-106	16	10	25.4
J14-H	MS27508E20B16P	XDS1-1	——	16	10	25.4
J14-J	MS27508E20B16P	A1R1-CCW	——	16	10	25.4

TABLE 4-2. WIRE LIST (cont)

TERMINATION		TERMINATION		AWG Wire Size	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN.	CM
J14-K	MS27508E20B16P	A1R1-COM	——	16	10	25.4
J14-L	MS27508E20B16P	A1R1-CW	——	16	10	25.4
J14-M	MS27508E20B16P	S1-31	MS25036-106	16	10	25.4
J14-N	MS27508E20B16P	S1-41	MS17143-15	16	10	25.4
J14-P	MS27508E20B16P	S1-22	MS25036-106	16	10	25.4
INDIVIDUAL ELECTRICAL LEADS						
XDS1-3	——	S1-11	MS25036-106	16	2.5	6.4
S1-17	MS25036-106	S1-18	MS25036-106	16	2.0	5.1
S1-18	MS25036-106	S1-12	MS25036-106	16	3.0	7.6
S1-37	MS25036-106	S1-38	MS25036-106	16	2.0	5.1
XF1-1	——	CR1-AC	——	16	9.5	24.1
XF1-2	——	T1-8	——	16	10.5	26.7
CR1-AC	——	T1-7	——	16	9.0	22.9
CR1- (-)	——	TB1-1	MS25036-153	16	9.0	22.9
A1K1-7	13221E9123-1	TB1-3	MS25036-153	16	8.0	20.3
A1-7	13207E5347-2	TB1-6	MS25036-153	16	5.0	12.7
A1-9	13207E5347-2	TB1-8	MS25036-153	16	5.0	12.7
K5-X2	MS25036-106	K4-X2	MS25036-106	16	3.5	8.9
K4-X2	MS25036-106	K3-X2	MS25036-106	16	3.5	8.9
TB1-3	MS25036-153	K3-X1	MS25036-106	16	3.0	7.6
TB3-6	MS17143-15	K1-A1	MS25036-112	12	8.0	20.3
TB3-8	MS17143-15	K1-B1	MS25036-112	12	8.0	20.3
TB3-10	MS17143-15	K1-C1	MS25036-112	12	8.0	20.3
K2-A1	MS25036-153	TB3-6	MS17143-14	14	9.0	22.9
K2-B1	MS25036-153	TB3-8	MS17143-14	14	8.5	21.4
K2-C1	MS25036-153	TB3-11	MS17143-14	14	6.0	15.2
K6-2	13207E5347-2	K1-X1	MS25036-106	16	4.0	10.2
K6-1	13207E5347-2	TB3-4	MS17143-14	16	7.0	17.8
S1-21	MS25036-106	S1-31	MS25036-106	16	3.0	7.6
M1 (-)	13207E5347-2	TB3-1	MS17143-14	14	7.0	17.8
TB3-2	MS17143-14	K2-X2	MS25036-106	16	8.0	20.3
TB3-2	MS17143-14	K1-X2	MS25036-106	16	7.0	17.8
TB3-4	MS17143-14	K2-X1	MS25036-106	16	9.5	24.1
S4	MS25036-153	S5	MS25036-153	16	10.0	25.4
T1-5	——	TB1-9	MS25036-153	16	17.0	43.2
T1-2	——	TB1-6	MS25036-153	16	19.0	48.3
K5-X2	MS25036-106	TB1-1	MS25036-153	16	7.0	17.8
K5-A1	MS25036-153	TB1-5	MS25036-153	14	10.0	25.4
K5-B1	MS25036-153	TB1-7	MS25036-153	14	12.0	30.5
K5-C1	MS25035-153	TB1-9	MS25036-153	14	14.0	35.6
K4-A1	MS25036-156	TB1-5	MS25036-156	12	8.0	20.3
K4-B1	MS25036-156	TB1-7	MS25036-156	12	9.5	24.1
K4-C1	MS25036-156	TB1-9	MS25036-156	12	11.0	27.9
K3-A1	MS25036-153	TB1-4	MS25036-153	14	6.0	15.2
K3-B1	MS25036-153	TB1-6	MS25036-153	14	7.5	19.1
KC-C1	MS25036-153	TB1-8	MS25036-153	14	9.0	22.9
T1-3	——	T1-4	——	16	4.0	10.2

4-4. REFRIGERATION SYSTEM REPAIRS GENERAL

The refrigeration system must be totally discharged before any maintenance action is performed on any system component. Leak testing and dehydrator replacement are required after any system component has been removed and replaced. The system must be evacuated before it is charged. The system must be properly charged to function properly.

WARNING

DANGEROUS CHEMICAL
is used in this equipment.
DEATH
or severe damage may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible. Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

WARNING

REFRIGERANT UNDER PRESSURE
is used in the operation of this equipment
DEATH
or severe injury may result if you fail to observe safety precautions. Never use a heating torch on any part that contains Refrigerant R-22. Do not let liquid refrigerant touch you, and do not inhale refrigerant gas.

4-5. DISCHARGING THE REFRIGERANT SYSTEM

Preliminary Procedure: Remove air conditioner from shelter, if necessary. (See paragraph 3-6.)

WARNING

Death or severe damage may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

a. Remove caps from the two service valve hose connections.

b. Connect the charging manifold hoses to the manifold and air conditioner service valves.

c. Attach a hose assembly to the center connection of the manifold.

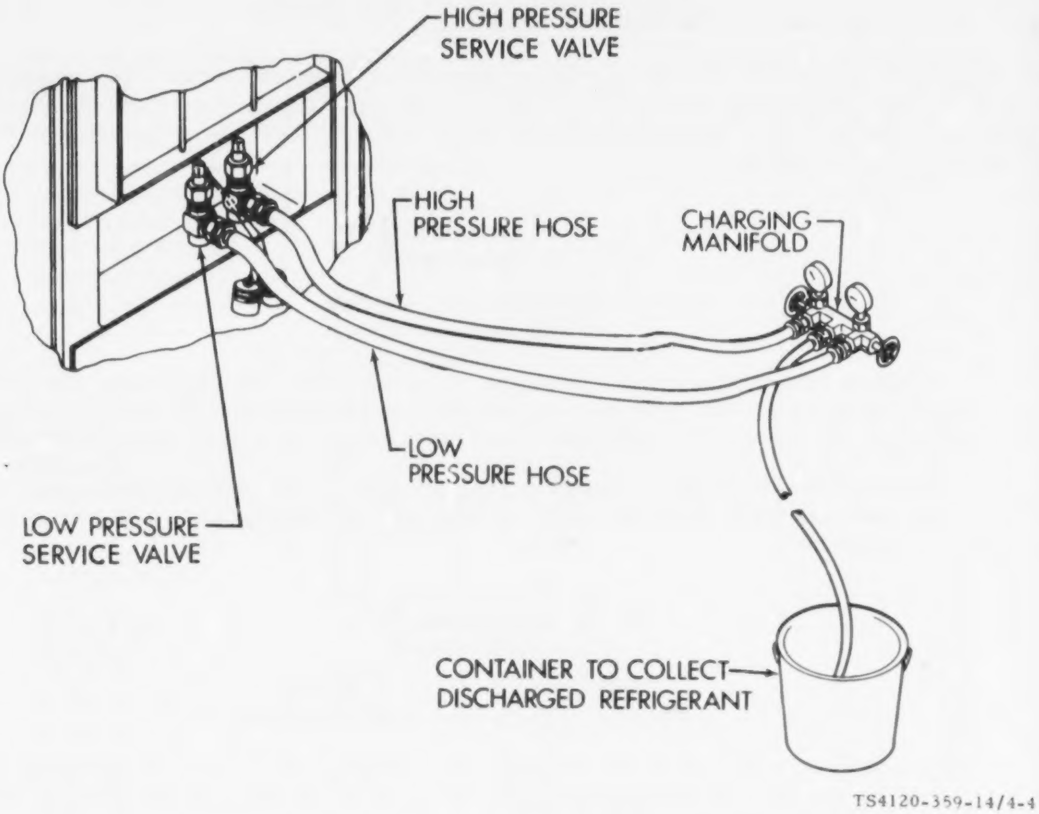

HIGH PRESSURE SERVICE VALVE
HIGH PRESSURE HOSE
CHARGING MANIFOLD
LOW PRESSURE HOSE
LOW PRESSURE SERVICE VALVE
CONTAINER TO COLLECT DISCHARGED REFRIGERANT
TS4120-359-14/4-4

Figure 4-4. Discharging Refrigerant

d. Place the open end of the center connection hose in a container that is located in a well ventilated area.

e. Open both manifold valves.

WARNING

Discharge refrigerant in an open area and *not* around an open flame.

CAUTION

Do not permit the oil to escape from the unit. If oil is escaping, close the valve(s) slightly.

Do not permit the refrigerant to escape fast enough to form ice or frost on either the lines or the valve.

f. Using a refrigeration wrench, *slowly* open the low pressure service valve to allow refrigerant gas to flow *slowly* out of the hose.

g. Using a refrigeration wrench, *slowly* open the high pressure service valve to allow refrigerant gas to flow *slowly* out of the hose.

h. Check the discharge hose for the presence of oil. Adjust valves if necessary to prevent oil discharge.

i. When gas stops flowing, close both service valves.

j. Go to paragraph 4-6.

4-6. PURGING THE REFRIGERANT SYSTEM

Preliminary Procedure: 1. Remove air conditioner from shelter, if necessary. (See paragraph 3-6.)

2. Discharge the refrigerant system. (See paragraph 4-5.)

Supplies: Dry nitrogen gas (item 2, Appendix E).

The refrigeration system must be purged with dry nitrogen, item 2, Appendix E, before any brazing is performed on any component. A flow of dry nitrogen at the rate of less than 1 - 2 cfm (0.028-0.057 m^3/minute) should be continued during all brazing operations to minimize internal oxidation and scaling.

CAUTION

Nitrogen cylinders are pressurized containers. The pressure in the cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times when nitrogen is used for leak check or purge operations.

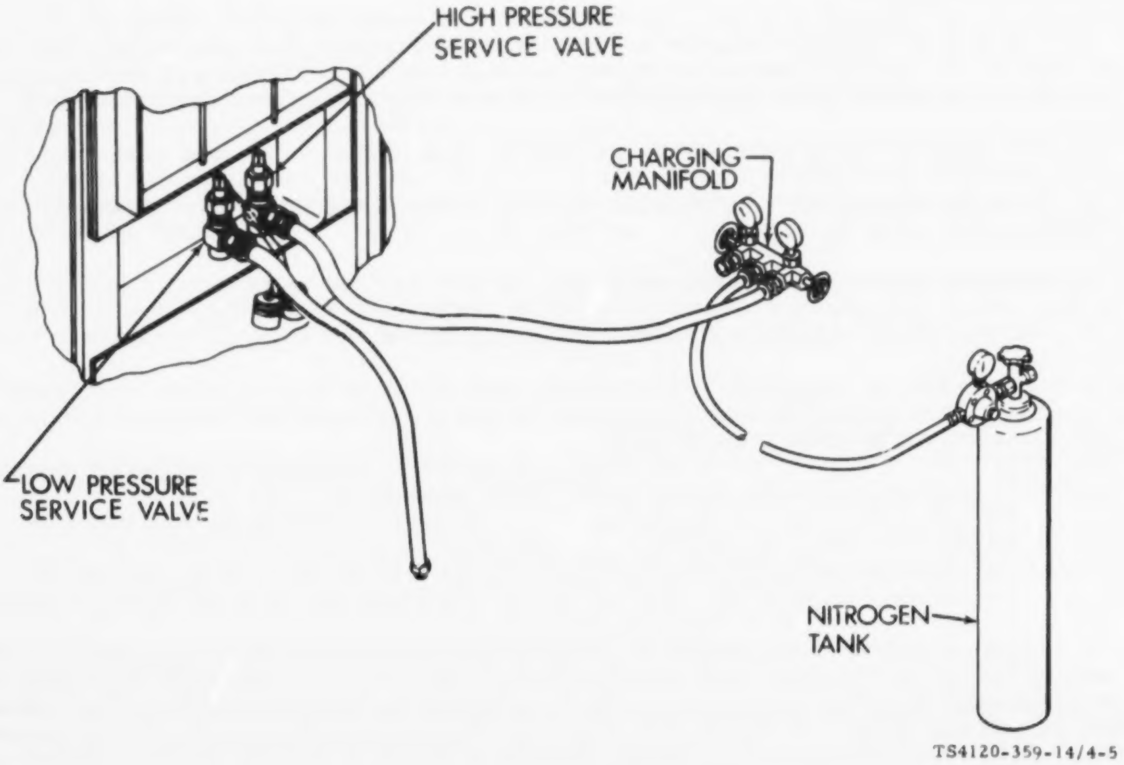


Figure 4-5. Nitrogen Purging Connection

CAUTION

Nitrogen is an inert gas. However, it also presents danger as a suffocant and, therefore, must also be discharged in a ventilated location.

Assuming that the system has been discharged using a manifold as described in paragraph 4-5, proceed as follows.

a. See specific component removal/repair instructions.

b. Be sure that refrigerant has been discharged. See paragraph 4-5.

c. Connect the center hose from the charging manifold to a nitrogen regulator and dry nitrogen tank.

d. The hose from the high pressure service valve to the charging manifold should be connected.

e. The hose from the low pressure service valve should be disconnected from the charging manifold.

f. Open both service valves on the unit.

g. Close the unused valve on the charging manifold, and open the one with the nitrogen tank hook up.

h. Open the nitrogen cylinder valve and adjust the regulator so that less than 1 - 2 cfm (0.028-0.057 m^3/minute) of nitrogen flows through the system.

i. Check discharge from hose attached to the low pressure charging valve to be sure that no oil is being forced out of the system.

j. Allow nitrogen to sweep through the system at the rate of less than 1 - 2 cfm (0.028-0.057 m^3/minute) for a minimum of 5 minutes, before starting any brazing operation. Then allow it to continue to flow at the same rate until all brazing operations are completed. (See paragraph 4-7 for brazing/debrazing procedures.)

k. After installation brazing operations are completed, allow nitrogen to flow for a minimum of 5 minutes.

l. Close nitrogen cylinder valve, nitrogen regulator, charging manifold valve, and both high and low pressure service valves on the unit.

m. Disconnect the hose from the nitrogen tank.

n. Assuming that all repairs are completed, go to paragraph 4-7.

4-7. BRAZING/DEBRAZING PROCEDURES

Supplies: Brazing alloy (silver and copper) (items 3 and 4, Appendix E)
Nitrogen cylinder (item 2, Appendix E)
Brazing flux (item 5, Appendix E)
Abrasive cloth (item 6, Appendix E)
Rags (item 7, Appendix E)

a. General. All tubing in the refrigeration system is seamless copper with a bright internal finish that permits thorough cleaning and prevents entrapment of moisture or other impurities. Rigid grade copper is used for straight sections and soft grade for sections that must be bent. All interconnecting fittings, such as elbows, tees, etc., are also copper. The bodies of all valves and all connections on other components are brass. All joints, except those provided with flare fittings, are made by brazing in accordance with MIL-B-7883, except that radiographic examination is not required.

b. Filler Alloy. Grade IV or VI brazing alloy and Type B flux, as specified in MIL-B-7883, must be used for all copper to brass joints, Grade III brazing may be substituted for Grade IV or VI for copper to copper joints; flux is not required for copper to copper joints.

c. Debrazing. Debraze joints for removal of refrigeration system components as follows:

WARNING

All Refrigerant-22 must be discharged from the system and the entire system must be purged with dry nitrogen before beginning any debrazing operation.

(1) Determine which joints are to be debrazed. Due to the limited work space inside the air conditioner, it may be more convenient to remove a part of the interconnecting tubing with the component rather than debrazing the joints on the component itself.

(2) Before debrazing a joint on a valve, disassemble the valve to the extent possible, then wrap all but the joint with a wet rag to act as a heat sink.

WARNING

The polyurethane foam used as insulation in the air conditioner will break down to form toxic gases if exposed to the flame of a torch or brazing temperature.

(3) Protect insulation, wiring harnesses, cabinet, and other surrounding components with appropriate shields.

(4) Be sure the work area is well ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of less than 1 - 2 cfm (0.028-0.057 m^3/minute).

(5) Apply sufficient heat uniformly around the joint to quickly melt the filler alloy. If heat is applied slowly, or only on one side, the entire component or length of tubing will be heated and filler alloy in adjacent joints may also be melted. Remove heat as soon as the joint separates.

d. Cleaning Debrazed Joints. All filler alloy must be cleaned from debrazed joints before reassembly. Heat each piece of the joint until the filler alloy is melted and then wipe it away with a damp cloth. Be sure no filler alloy or other debris are left inside any tubing, fitting or component.

e. Reassembly. If tubing sections or fittings were removed with a component, debraze them from the component, clean the joints, and braze them to the new component before reinstallation.

f. Brazing. Braze joints within the air conditioner as follows:

(1) Position the component to be installed.

(2) To prepare a joint on a valve for brazing, disassemble the valve to the extent possible. Then wrap all but the joint with a wet rag to act as a heat sink.

(3) Protect insulation, wiring harnesses, and surrounding components with appropriate shields.

(4) Be sure the work area is well ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of less than 1 - 2 cfm (0.028-0.057 m^3/minute).

(5) Apply sufficient heat uniformly around the joint to quickly raise it to a temperature that will melt the filler alloy. Remove heat as soon as brazing is completed.

4-8. LEAK TESTING THE REFRIGERANT SYSTEM

Supplies: Dry nitrogen gas (item 2, Appendix E)
Refrigerant 22 (item 8, Appendix E)

a. The entire repair area should be thoroughly leak tested after repair or replacement of any component, before it is recharged with Refrigerant-22. Leak testing is also the method for troubleshooting when a system has lost all or part of its refrigerant charge through an undetermined cause.

b. Testing Method. There are two acceptable methods for leak testing the refrigeration system.

(1) Refrigerant gas leak detector. If an electronic refrigerant gas leak detector is available it should be used in accordance with the procedures contained in TM 9-4940-435-14, "Leak Detector, Refrigerant Gas".

NOTE

The electronic refrigerant gas leak detector is highly sensitive to the presence of a minute quantity of gas in the air, and due to this factor is quite effective in the detection of small leaks. However, due to the rapid dispersion of refrigerant gas into the surrounding air, difficulty may be encountered in pinpointing large leaks. The detector must be used in a well ventilated but draft-free area.

(2) Soap solutions. In this method, a strong solution of a liquid detergent and water is brushed onto all points of possible leakage while closely observing for the formation of bubbles.

CAUTION

If the soap solution testing method is used, thoroughly rinse with fresh water after testing is completed. A residual soap film will attract and accumulate an excessive amount of dust and dirt during operation.

c. Testing procedures. To perform leak testing by use of the electronic detector, it is necessary that the system be pressurized with a proportion of refrigerant gas. To perform leak testing by use of the soap solution method the system may be pressurized with dry nitrogen alone.

(1) To pressurize a system that has some refrigerant charge, for either leak testing method:

(a) Remove the caps from the high and low pressure service valves.

(b) Connect the hoses from a charging manifold to the service valves.

NOTE

If it is possible that the problem may not be a leak and that you may not have to replace a refrigeration system component, Refrigerant-22 may be substituted for the nitrogen in the following test. If nitrogen is used, you will have to discharge, evacuate and recharge the system after this test is completed.

(c) Connect a nitrogen pressure regulator and nitrogen bottle to the center hose connection of the charging manifold.

(d) Open the unit service valves and the charging manifold valves.

(e) Open the nitrogen tank valve and pressurize the system to 350 psi (24.7 kg/cm^2).

(f) Perform leak tests.

(g) If a leak is found, discharge and purge the system and repair leak. See specific instructions for components to be removed.

(h) If a leak was not found and Refrigerant-22 was used to pressurize the system, see charging instructions.

(2) To pressurize a system that has been discharged and purged, for leak testing with an electronic detector:

(a) Remove the caps from the high and low pressure service valves.

(b) Connect the hoses from a charging manifold to the service valves.

(c) Connect a drum of Refrigerant-22 to the center hose connection of the charging manifold.

CAUTION

Connect the Refrigerant-22 drum so that only *gas* will be used for pressurization.

(d) Open both unit service valves and the charging manifold valves.

(e) Open the refrigerant drum valve slightly and adjust as necessary to prevent formation of frost, and allow system pressure to build up until the gages read 40-50 psi (2.8 - 3.5 kg/cm^2).

(f) Close the charging manifold valves and the refrigerant drum valve.

(g) Remove the Refrigerant-22 drum from the center hose connection.

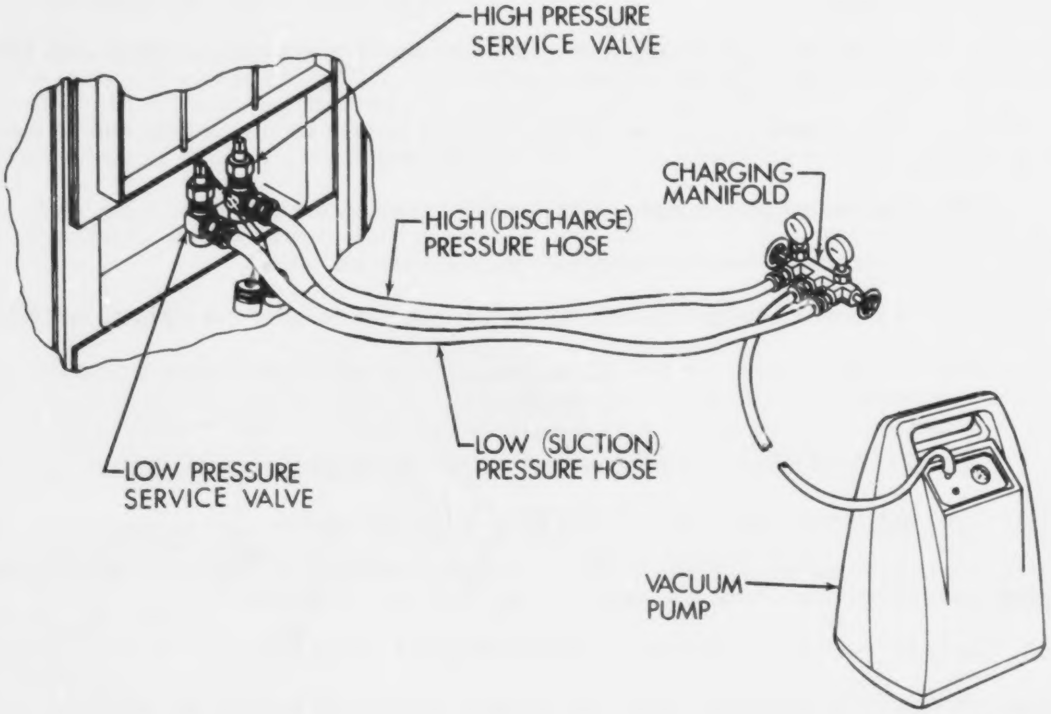
(h) Connect a nitrogen regulator and cylinder of dry nitrogen to the center hose connection.

(i) Open the charging manifold valves and the nitrogen cylinder and regulator valve, allow system pressure to build up until gages read 350 psi (24.7 kg/cm^2).

(j) Perform leak tests, then discharge and purge the system, in accordance with paragraphs 4-5 and 4-6 before performing maintenance, or before evacuating and charging the system, as appropriate.

(3) Final Leak Testing. Always perform a final leak test after performing any repair or replacement of components before the air conditioner is reassembled and the refrigeration system is evacuated and charged.

4-9. EVACUATING THE REFRIGERANT SYSTEM


HIGH PRESSURE SERVICE VALVE
CHARGING MANIFOLD
HIGH (DISCHARGE) PRESSURE HOSE
LOW (SUCTION) PRESSURE HOSE
LOW PRESSURE SERVICE VALVE
VACUUM PUMP

TS4120-359-14/4-6

Figure 4-6. Evacuation of Refrigeration System

The refrigeration system must be evacuated to remove all moisture before it is charged with Refrigerant-22.

CAUTION

Don't evacuate a leaking system. The vacuum created can cause air, moisture, and dirt to enter system.

a. Check that system was leak tested and has NO LEAKS.

b. Check that new filter-drier was installed. If not, install one.

c. Check that both service valves and charging manifold valves are closed.

d. Attach hose assemblies to service valves and charging manifold valves.

e. Attach center hose assembly to vacuum pump.

f. Start vacuum pump.

g. Open charging manifold valves.

h. Open both unit service valves.

i. Run the vacuum pump until at least 29 inches of mercury, measured on the gage, is reached.

NOTE

Inability to reach 29 inches of mercury may indicate either a leak *or* a problem with the pump.

j. Continue running the pump for one more hour, while observing the gage. If the gage needle moves back and forth, you have a leak which must be located and corrected first.

k. Close charging manifold valves.

l. Close both unit service valves.

m. Stop vacuum pump.

n. Disconnect pump from center hose connection.

o. Go to paragraph 4-10, charging the refrigeration system.

4-10. CHARGING THE REFRIGERATION SYSTEM

Supplies: Dehydrator
Refrigerant 22 (Drum) (item 8, Appendix E)

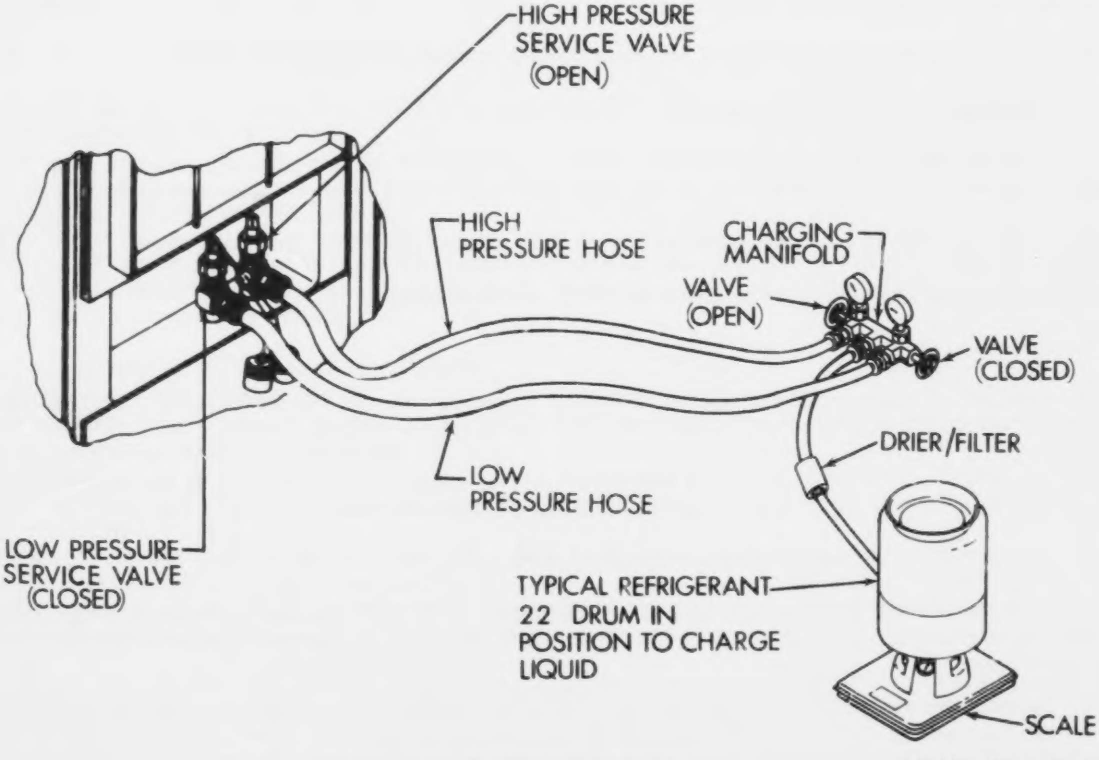

HIGH PRESSURE SERVICE VALVE (OPEN)
HIGH PRESSURE HOSE
CHARGING MANIFOLD
VALVE (OPEN)
VALVE (CLOSED)
DRIER/FILTER
LOW PRESSURE HOSE
LOW PRESSURE SERVICE VALVE (CLOSED)
TYPICAL REFRIGERANT 22 DRUM IN POSITION TO CHARGE LIQUID
SCALE

Figure 4-7. Refrigerant Charging

TS4120-359-14/4-7

After the system has been satisfactorily evacuated, it must be fully charged with Refrigerant-22.

CAUTION

Never introduce liquid refrigerant into the low pressure (suction) service valve.

NOTE

The system must be evacuated before charging. Use only Refrigerant-22 to charge the unit.

a. Check that the hose from the low pressure service valve is connected to the compound gage side of the charging manifold. The hose from the high pressure service valve should be connected to the pressure gage side of the charging manifold.

b. Connect the center hose from the charging manifold to a well charged drum of Refrigerant-22.

c. Loosen the hose connections to the two air conditioner service valves slightly.

d. Open the two charging manifold valves.

e. Open the Refrigerant-22 drum valve slightly to allow a small amount of refrigerant to purge air from the hoses. Tighten the hose connections at the air conditioner service valves.

f. Close the low pressure (suction) charging manifold valve. *Never* introduce liquid refrigerant into the low pressure (suction) service valve.

g. Position the Refrigerant-22 drum so that liquid will be used for charging. (Some drums must be inverted and some are equipped with a selector valve.)

h. Using accurate scales measure and record the weight of the Refrigerant-22 drum.

i. Open the Refrigerant-22 drum valve.

j. Open the high pressure service valve on the air conditioner. Allow liquid refrigerant to enter the system until the drum weight has decreased by 6 pounds (2.93 Kg) or until system pressure has equalized.

k. Close the refrigerant drum valve and the high pressure (discharge) manifold valve.

l. Connect air conditioner to a remote control module assembly.

m. Connect power.

n. Turn air conditioner on and operate in the COOL mode with the TEMPERATURE CONTROL set at the maximum COOLER position.

o. If the 6 pound (2.93 kg) full charge was obtained, skip steps p through s. If the system pressure equalized prior to obtaining a full charge of 6 pounds (2.93 kg) proceed with step p.

p. Switch the refrigerant drum to the *gas* only position.

q. Be sure that the refrigerant drum has been switched to the gas position and open the refrigerant drum valve, the low (suction) pressure charging manifold valve and the low (suction) pressure service valve on the air conditioner.

r. Monitor the weight of the refrigerant drum as the air conditioner compressor pulls additional refrigerant ***gas*** **into the system until the full 6 pound (2.93 kg) charge is obtained. When the system is fully charged, immediately close the refrigerant drum valve and the air conditioner low pressure service valve.**

s. Run the air conditioner in COOL mode (with TEMPERATURE CONTROL in full COOLER position) for 15 minutes.

CAUTION

Do not skip the next step.

t. After 15 minutes, observe the sight glass on back of condenser section.

- *Green center* means the refrigerant moisture content is acceptable.
- *Yellow center* means there is too much moisture in the system. It *must be discharged, evacuated and charged again.*
- *Milky white or bubbly* liquid means the system has a low charge.
- *Clear bubble-free* liquid around the center means the system is fully charged.

u. If charge is *low*, add *gas* refrigerant.

(1) Be sure that drum is switched to *gas* position. Open the drum valve and the air conditioner low pressure service valve.

(2) Continue to charge until sight glass is clear and bubble-free.

(3) Close the refrigerant drum valve and the air conditioner low pressure service valve.

v. Check air conditioner for proper cooling. There should be at least a 20° ± 5°F temperature difference between evaporator discharge air and the inlet air.

w. Turn the MODE SELECTOR SWITCH to OFF.

x. Close the high and low pressure air conditioner service valves, and remove the charging manifold hoses from the air conditioner service valves.

4-11. REFRIGERANT PRESSURE CHECK

Except in cases where it is obvious that the refrigerant charge has been lost, the first step in troubleshooting problems in the refrigeration system should be to check discharge and suction pressures under operating conditions. Check pressures as follows:

a. Turn the MODE SELECTOR SWITCH to OFF.

b. Connect individual pressure gages, or a refrigeration servicing manifold and hoses to the high (discharge) and low (suction) service valves.

c. Open the low (suction) and high (discharge) service valves.

d. Both gages should read the same. Check the reading with the appropriate column in Table 4-3. If the system is even partially charged, the pressure should be approximately equal to that shown in the table for the appropriate ambient temperature. If the pressure is considerably less than shown in the table, the system does not contain enough refrigerant to continue the pressure check; go to leak testing.

e. Turn the MODE SELECTOR SWITCH to the COOL mode with the TEMPERATURE CONTROL in the full COOLER setting for a few minutes.

f. With the unit operating, allow gages to stabilize. Take readings of the two gages

(1) If discharge and suction pressures are at, or near, the same value, a pressure equalizer solenoid valve L1 malfunction, or an internal compressor failure is indicated.

(2) If discharge pressure is low and suction pressure is normal, (see table 4-3.) a low refrigerant charge is indicated.

(3) If discharge pressure is normal and suction pressure is either high or low, failure or maladjustment of the pressure regulator valve is indicated.

(4) If discharge pressure is high and suction pressure is normal, a malfunction of quench valve is indicated.

g. When pressure tests are completed, proceed with the maintenance action indicated.

Table 4-3. PRESSURE-TEMPERATURE RELATIONSHIP OF SATURATED REFRIGERANT-22

Temperature		Pressure		Temperature		Pressure	
Deg F	Deg C	Psig	kg/em^2	Deg F	Deg C	Psig	kg/em^2
10	-12.3	32.93	2.315	66	18.9	114.2	8.029
12	-11.1	34.68	2.439	68	20.0	118.3	8.318
14	-10.0	36.89	2.593				
16	- 8.9	38.96	2.739	70	21.1	122.5	8.612
18	- 7.8	41.09	2.889	72	22.2	126.8	8.915
				74	23.3	131.2	9.225
20	- 6.6	43.28	3.043	76	24.4	135.7	9.541
22	- 5.5	45.23	3.180	78	25.6	140.3	9.864
24	- 4.3	47.85	3.364				
26	- 3.4	50.24	3.532	80	26.7	145.0	10.195
28	- 2.2	52.70	3.705	82	27.8	149.8	10.522
				84	28.9	154.7	10.877
30	- 1.1	55.23	3.883	86	30.0	159.8	11.236
32		57.83	4.066	88	31.1	164.9	11.594
34	1.1	60.51	4.254				
36	2.2	63.27	4.448	90	32.2	170.1	11.960
38	3.3	66.11	4.648	92	33.3	175.4	12.332
				94	34.5	180.9	12.719
40	4.4	69.02	4.853	96	35.6	186.5	13.113
42	5.5	71.99	5.062	98	36.7	192.1	13.506
44	6.6	75.04	5.276				
46	7.7	78.18	5.497	100	37.8	197.9	13.914
48	8.8	81.40	5.723	102	38.9	203.8	14.329
				104	40.0	209.9	14.758
50	10.0	84.70	5.955	106	41.1	216.0	15.187
52	11.1	88.10	6.257	108	42.2	222.3	15.630
54	12.2	91.5	6.433				
56	13.3	95.1	6.686	110	43.3	228.7	16.080
58	14.5	98.8	6.947	112	44.4	235.2	16.537
				114	45.6	241.9	17.008
60	15.6	102.5	7.206	116	46.7	248.7	17.486
62	16.7	106.3	7.474	118	47.8	255.6	17.971
64	17.8	110.2	7.748				

Table 4-4. NORMAL OPERATING PRESSURES

Temperatures	Pressure Range (psig)			
Outdoor ambient	50F (10C)	75F (24C)	100F (38C)	120F (49C)
90F (32C) Return Air to Unit (Dry Blub)	55-65 Suction 125-160 Discharge	59-70 Suction 175-210 Discharge	60-75 Suction 255-295 Discharge	75-90 Suction 370-410 Discharge
80F (27C) Return Air to Unit (Dry Blub)	58-65 Suction 120-155 Discharge	58-70 Suction 170-205 Discharge	60-75 Suction 250-290 Discharge	65-75 Suction 370-410 Discharge

4-12. FINISH REPAINTING AND REFINISHING GENERAL

Tools: Refer to SB 11-573, painting and preservation supplies available for field use for electronics command equipment.

Supplies: Yellow primer MIL-P-52192 or TT-P-1757 (item 9, Appendix E) Forest Green enamel, MIL-E-52798 (item 10. Appendix E).

a. Touch up and repaint in accordance with TB 746-10, field instructions, for painting and preserving electronics command equipment.

b. Care for painting equipment in accordance with TM 9-213, painting instructions for field use.

Section IV ITEMIZED MAINTENANCE PROCEDURE

4-13. GENERAL

The procedures in this section have been arranged in the order in which the items appear in the direct support (F) maintenance category column on the Maintenance Allocation Chart (MAC) which is provided in Appendix B. Step-by-step procedures have been provided for all authorized to be performed by direct support maintenance in the order in which they appear on the MAC. Actions authorized to be performed by general support maintenance have been duly noted; step-by-step procedures for these actions may be found in Chapter 5.

4-14. EVAPORATOR ASSEMBLY AND CONDENSER ASSEMBLY SEPARATION AND RECONNECTION

Preliminary Procedures:
1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove access cover, (See paragraph 3-14.)
3. Remove right end condenser cover. (See paragraph 3-26.)
4. Remove left end condenser cover (See paragraph 3-27.)

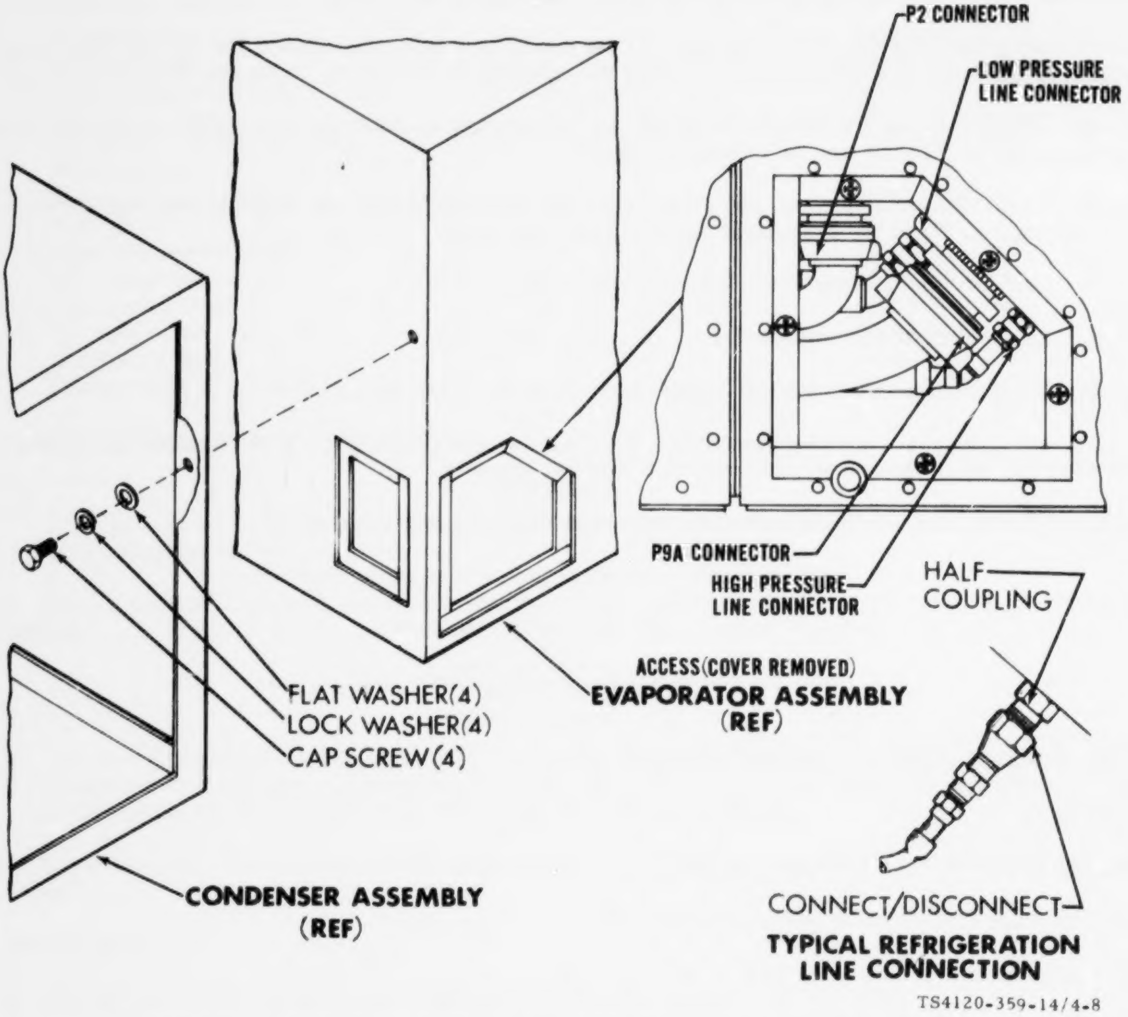


Figure 4-8. Evaporator/Condenser Assembly Separation and Reconnection

a. Disassembly. (Separation of evaporator and condenser assemblies.)

(1) Using socket or combination wrench, remove four each hex head cap screws, lock washers, and flat washers that hold the evaporator and condenser assemblies together.

(2) Disconnect the P9A plug.

(3) Disconnect the P2 plug.

(4) Using open end wrenches, carefully disconnect the low and high condenser to evaporator refrigerant metal hose line connectors from the evaporator assembly half couplings.

(5) Carefully pull the evaporator assembly away from the condenser assembly.

b. Assembly. (Reconnection of evaporator and condenser assemblies.)

(1) On a level surface, place the back of the evaporator assembly next to the front of the condenser section. (Metal hose assemblies and slit in feed thru gaskets and mounting holes should match.)

(2) Carefully guide the refrigerant metal hose assemblies thru the evaporator housing opening and slide the evaporator and condenser assemblies together.

(3) Use open end wrenches, and connect the low and high condenser to evaporator refrigerant metal hose line connectors to the evaporator assembly half couplings.

(4) Leak test the connections. (See paragraph 4-8.)

(5) Connect J2 and J9 connectors.

(6) Move the two sections snug against each other and aline the holes.

(7) Using socket or combination wrench, secure the evaporator and condenser assemblies together with four each hex head cap screws, lock washers, and flat washers.

Follow-on Procedures:
1. Install left end condenser cover. (See paragraph 3-27.)
2. Install right end condenser cover. (See paragraph 3-26.)
3. Install access cover. (See paragraph 3-14.)
4. Install air conditioner on shelter. (See paragraph 3-6.)

4-15. ELASTIC CORD (FILTER RETAINER)

Tools: Knife

Supplies: Adhesive (item 11, Appendix E)

a. For inspection/removal, see paragraph 3-12.

b. Cut cord to 7 ± 0.25 inch (17.8 ± 0.6 cm)

c. Dip ends of cord in adhesive, item 11, Appendix E.

d. Allow adhesive time to dry and trim frayed ends.

e. For installation, see paragraph 3-12.

4-16. FRESH AIR DUCT, OUTSIDE COVERS, SCREENS, FRAMES, GUARDS, AND INFORMATION AND IDENTIFICATION PLATES

Supplies: Acetone or methyl-ethyl ketone (MEK)
Adhesive (item 12, Appendix E)

a. General. The only authorized repairs for the fresh air duct, outside covers, frames, and grilles are: replacement of EMI gaskets, adhesive backed gaskets, insulation, name and information plates, riveted fasteners and riveted lifting rings. These procedures cover only those actions normally performed by direct support maintenance personnel. It is assumed that, where appropriate, the removal and installation of the item to be repaired or replaced will be performed by organizational maintenance personnel in accordance with procedures in Chapter 3.

b. For inspection, removal and installation of item, see the following paragraph references as applicable.

Fresh air duct	paragraph 3-13
Access cover	paragraph 3-14
Front evaporator cover	paragraph 3-17
Return air frame	paragraph 3-18
Evaporator discharge frame	paragraph 3-19
Fresh air cover	paragraph 3-20
Top evaporator cover	paragraph 3-21
Feed thru cover	paragraph 3-22
Front condenser cover	paragraph 3-23
Top condenser cover	paragraph 3-25
Right end condenser cover	paragraph 3-26
Left end condenser cover	paragraph 3-27
Condenser guard	paragraph 3-28
Condenser discharge grille	paragraph 3-29

c. Removal of bad gasketing or insulation.

NOTE

Prior to removal of old gasket material or insulation, cut the new replacement material to size using the old item as a sample.

(1) Remove as much old gasket or insulation material as possible by pulling or scraping it away from the metal surface.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

(2) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

d. Gasket installation

(1) Use only approved replacement material as specified in TM 5-4120-359-24P.

(2) EMI gasket material and regular gasketing specified for this unit are supplied with adhesive backing.

(3) Cut gasket to size. Be sure that EMI gasket corners are mitered so that good continuous edge contact is made.

(4) Be sure that surface to which gasket is to be applied is clean and free of paint and old adhesive material.

(5) Remove backing material from adhesive side and immediately press gasket in place. *Be sure* that good edge to edge contact is made on the EMI gaskets.

e. Insulation installation

(1) Cut to size.

(2) Be sure that the surface to which the insulation is to be applied is clean and free of paint and old adhesive material.

(3) Coat the mating surfaces of the metal and the insulation with adhesive (item 12, Appendix E). Let both surfaces air dry until the adhesive is tacky but will not stick to the fingers.

(4) Starting with an end, carefully attach the insulation to the metal. Press into firm contact all over.

f. Replacement of name and information plates, riveted fasteners and lifting rings.

(1) Use a drill bit slightly smaller than the diameter of the rivet being removed.

(2) Drill the rivets out and remove the old part.

(3) Aline holes in replacement part and cover and install new rivets.

g. Minor dents and bent edges can be straightened using common sheet metal repair procedures. Panels that are badly dented, bent, or punctured should be replaced.

h. Should touch up or refinishing be necessary, see paragraph 4-12.

4-17. RADIO FREQUENCY FILTER (FLI)

Preliminary Procedure: Remove air conditioner from shelter. (See paragraph 3-6.)

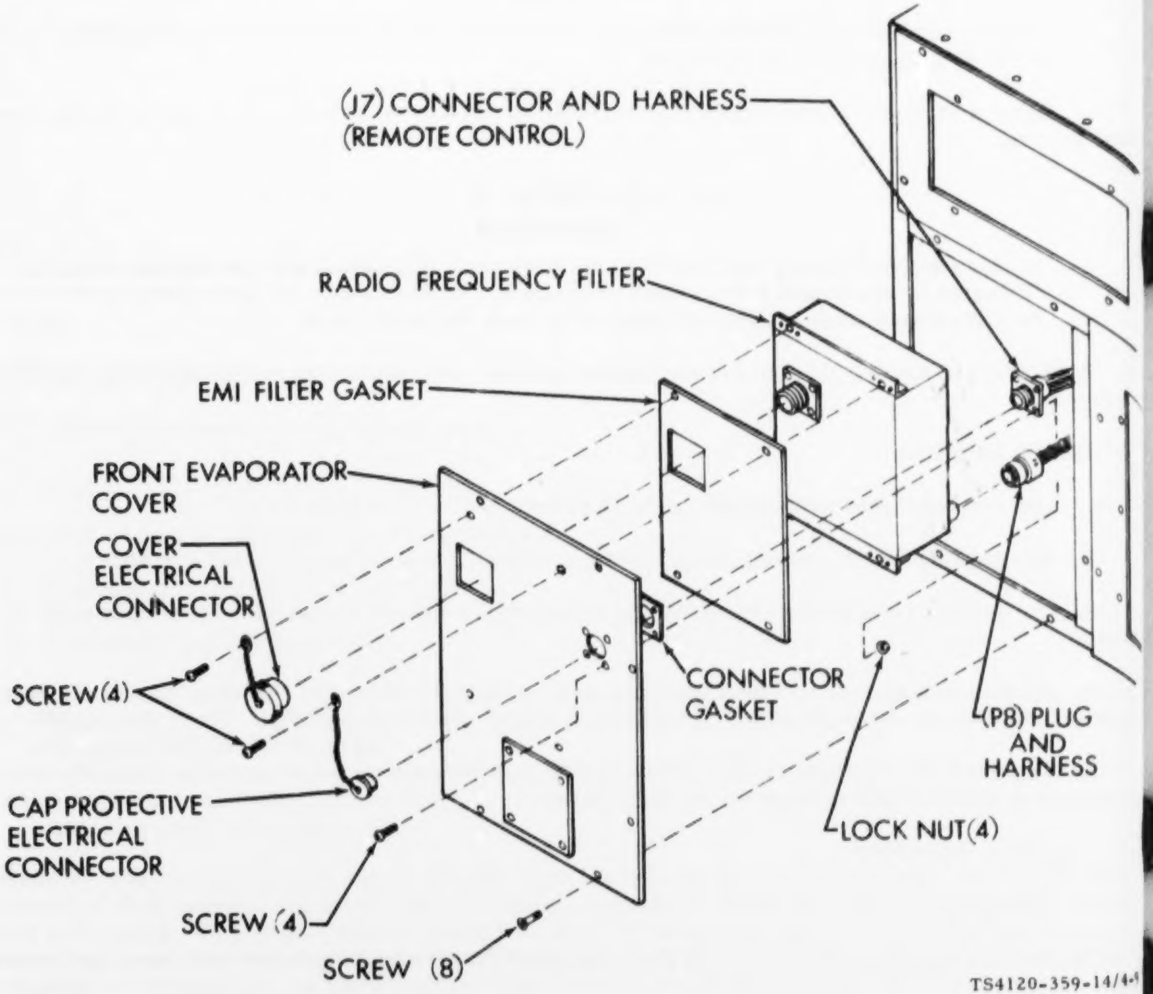


Figure 4-9. Radio Frequency Filter (FLI)

a. Removal

(1) Using screwdriver, remove eight screws from the outside edges of the front cover, while supporting (holding) cover.

(2) Carefully slip front cover out and down so that the radio frequency filter can be supported (held) while it is removed.

(3) Using screwdriver, remove four screws from the radio frequency filter. The protective cap and cover for the electrical connectors will come off when the two top screws are removed. Take care that they are not lost.

(4) Sit the filter down on the inside of the evaporator housing. Take care that the EMI filter gasket is not damaged or lost.

(5) Using a screwdriver, socket and ratchet, remove the four screws and lock nuts from the remote control harness connector (J7)

(6) Remove the connector (J7) harness and connector gasket from the back side of the cover. Take care that the connector gasket is not lost.

(7) Slide the radio frequency filter out and disconnect the P8 plug and harness from the back side of the filter.

b. Inspection

(1) Check the radio frequency filter housing for physical damage such as dents, punctures, cuts, and ruptured seams. Replace if damaged.

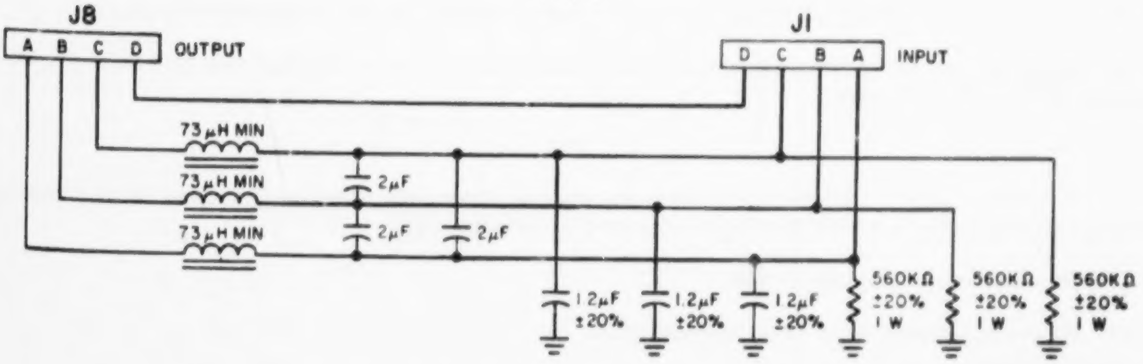
(2) Look for evidence of overheating. Replace if overheating is indicated.

(3) Check that connectors are secure and contacts are tight and not damaged. Replace if connectors or contacts are loose or damaged.

(4) Check that EMI filter gasket is in good condition. Replace if damaged.

c. Testing. Using figure 4-10, continuity test the filter. Replace if found bad.

Continuity-Test J1 to J8
A to A
B to B
C to C
D to D



TS4120-359-14/4-10

Figure 4-10. Radio Frequency Filter (FLI) Internal Diagram

NOTE

Continuity testing does not necessarily predict the behavior of capacitors under load. If the filter still does not operate properly after passing the continuity test, substitute a filter known to be good.

d. Installation

(1) Connect the P8 plug and harness to the J8 connector on the back side of the filter.

(2) Using a screwdriver, socket and ratchet, attach the remote control harness connector (J7) and connector gasket to the front evaporator cover with four screws and lock nuts.

(3) Aline the holes in the EMI gasket, radio frequency filter and front evaporator cover.

(4) Using a screwdriver, install the two bottom screws in the cover and radio frequency filter.

(5) Using a screwdriver, attach the chain ends for the protective connector cap and cover when the two top radio frequency filter mounting screws are installed.

(6) Line up screw holes in cover and air conditioner housing.

(7) Using screwdriver, install cover with eight screws.

Follow-on Procedure: Install air conditioner on shelter. (See paragraph 3-6.)

4-18. EMI SCREENS

a. Removal/Installation. For removal/installation, see the following paragraph references as applicable:

Evaporator return EMI screen	paragraph 3-18
Evaporator discharge EMI screen	paragraph 3-19
Fresh air EMI screen	paragraph 3-13
Condenser inlet EMI screen	paragraph 3-28
Condenser discharge EMI screen	paragraph 3-29

b. Inspection

(1) Check that screen frame is not bent, dented, or mashed. Replace if damaged.

(2) Check that honeycomb area is not crushed, dented, pierced, or torn. Replace if damaged.

(3) Check that gaskets are not loose, torn, or missing. Replace screen if gaskets are damaged.

(4) Check that screen is not clogged with dirt or other material that would block free air flow thru screen. Clean screen if dirty or clogged.

c. Clean

(1) Wash screens in a mild detergent and water solution. If possible, use a large flat pan. Move screen up and down so that water is forced thru the honeycomb to dislodge dirt.

(2) Rinse thoroughly in clear water.

(3) Shake out excess water prior to installation.

4-19. EVAPORATOR ASSY WIRING HARNESSES AND BULKHEAD CONNECTORS

Preliminary Procedures:
1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove radio frequency filter and front evaporator cover. (See paragraph 4-17.)
3. Remove top evaporator cover. (See paragraph 3-21.)
4. Remove access cover. (See paragraph 3-14.)

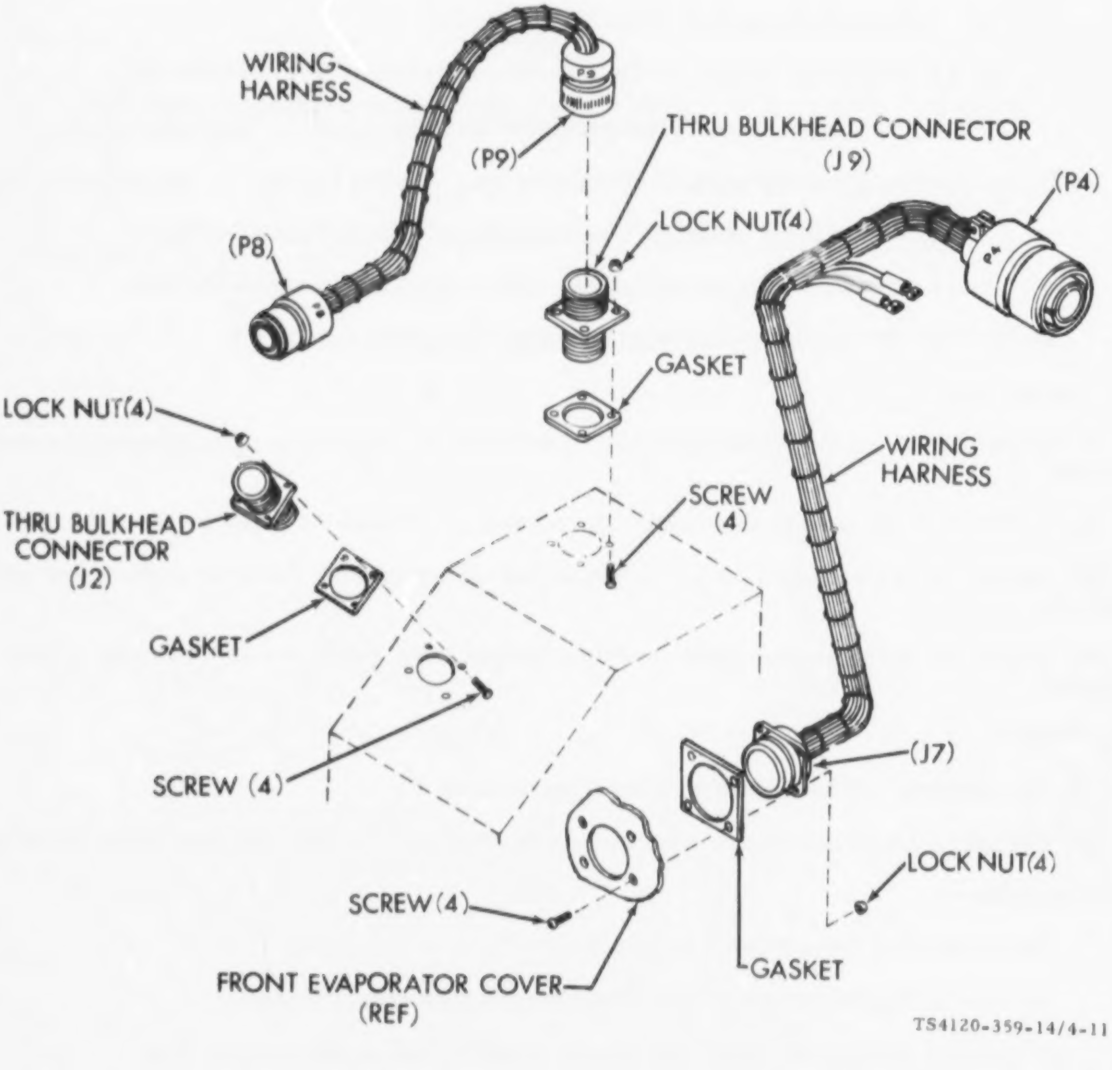


Figure 4-11. Evaporator Assy Wiring Harnesses and Bulkhead Connectors

a. Removal

(1) To remove the P4 to J7 wiring harness:

- Disconnect the two quick-disconnect terminals to the air temperature sensing probe.
- Disconnect plug P4 from the J4 connector on the electrical module.

(2) To remove the P8 to P9 wiring harness:

- Disconnect the plug P9 from the J9 thru-bulkhead connector.

(3) To remove the J9 thru-bulkhead connector:

- Disconnect the P9A plug from inside the access box.
- Using a screwdriver, socket, and ratchet, remove the four screws and lock nuts.
- Carefully remove the thru-bulkhead connector and gasket.

(4) To remove the J2 thru-bulkhead connector:

- Disconnect the P2 and P2A plugs from the top and bottom of the connector.
- Using a screwdriver, socket, and ratchet, remove the four screws and lock nuts.
- Carefully remove the thru-bulkhead connector and gasket.

b. Inspect/Test

(1) Check connectors for general condition, loose, broken, or missing contacts. Replace connectors if damaged.

(2) Check individual wires for loose solder connections, cut or frayed insulation, and cut or broken wires.

(3) See wiring diagram figure 4-3 and continuity test individual wires. Repair or replace wires with no continuity.

(4) Check that gaskets are in good condition. Replace them if they are torn, missing, or otherwise damaged.

c. Repair.

(1) See paragraph 4-3 for general wire repair instructions.

(2) See table 4-2 Wire List for wire lengths and terminal information when individual wires are replaced.

d. Installation

(1) To install the J2 thru-bulkhead connector:

- Line up the holes in the gasket, connector, and evaporator housing.
- Using a screwdriver, socket and ratchet, install the four screws and lock nuts.
- Reconnect the P2 and P2A plugs to the top and bottom of the thru-bulkhead connector.

(2) To install the J9 thru-bulkhead connector:

- Line up the holes in the gasket, connector, and evaporator housing.
- Using a screwdriver, socket and ratchet, install the four screws and lock nuts.
- Reconnect the P9A plug from inside the access box.

(3) Connect the P9 plug and harness to the J9 thru-bulkhead connector.

(4) To install the P4 to J7 wiring harness:

- Connect the P4 plug to J4 on the electrical module.
- Reconnect the two quick-disconnect terminals to the air temperature sensing probe.

NOTE

At this point, all connections should be complete except for J7 and P8. They will be reconnected when the radio frequency filter and front cover are installed.

Follow-on Procedures:

1. Install radio frequency filter and front evaporator cover. (See paragraph 4-17.)
2. Install top evaporator cover. (See paragraph 3-21.)
3. Install access cover. (See paragraph 3-14.)
4. Install air conditioner on shelter. (See paragraph 3-6.)

4-20. TEMPERATURE SENSING PROBE (A1-RT)

Preliminary Procedures:
1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove return air screen and frame. (See paragraph 3-18.)
3. Remove front evaporator cover. (See paragraph 3-17.)

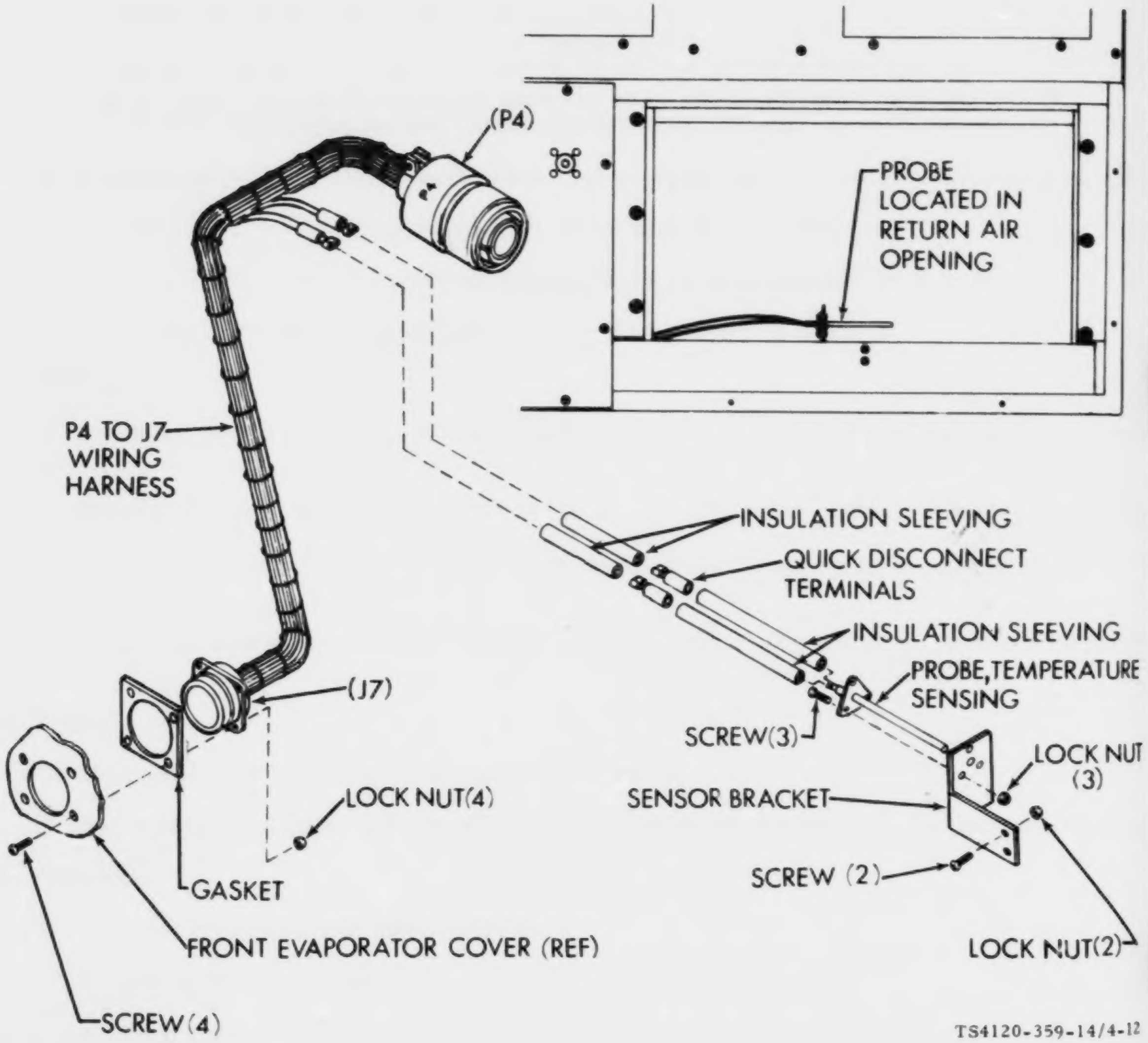


Figure 4-12. Temperature Sensing Probe

a. Inspection/Test Installed

(1) Disconnect the two quick-disconnect terminals from the P4 to J4 harness.

(2) Check resistance between probe leads. Resistance should be zero. If it is not, replace the temperature sensing probe.

(3) Check that probe leads are securely attached to probe and that probe is in good condition. If it is bent, dented or otherwise damaged, replace it.

(4) Check that sensor bracket is securely attached and in good condition. If it is loose, tighten hardware. If it is damaged, replace it.

b. Removal

(1) Disconnect the two quick-disconnect terminals from the P4 to J4 harness.

(2) Carefully pull the leads through the side panel.

(3) Using screwdriver and wrench, remove the three screws and lock nuts.

(4) Remove the temperature sensing probe.

(5) If the sensor bracket is to be replaced, use a screwdriver and wrench and remove the two screws and lock nuts. Remove the bracket.

c. Installation. If the old probe is to be reinstalled, skip to step (4).

(1) The sensing probe will be supplied with leads. Slip insulation sleeving over each lead for the entire length, approximately 20 inches (50.8 cm).

(2) Install a quick-disconnect terminal on each of the two probe lead ends.

(3) Slip a short length, approximately 3 inches (7.6 cm), of insulation sleeving over the quick-disconnect terminals.

(4) If the sensor bracket was removed, use a screwdriver and wrench, and install the bracket with the two screws and lock nuts.

(5) Use a screwdriver and wrench and install the probe to the bracket with three screws and lock nuts.

(6) Work the leads through the side panel and connect the two quick-disconnect terminals to the terminals on the P4 to J7 harness.

(7) Slip the insulation sleeving over the quick-disconnect terminals.

Follow-on Procedure: 1. Install the front evaporator cover. (See paragraph 3-17.)

2. Install the return air screen and frame. (See paragraph 3-18.)

3. Install the air conditioner on the shelter. (See paragraph 3-6.)

4-21. EVAPORATOR FAN (IMPELLER) AND MOTOR ASSEMBLY REMOVAL AND INSTALLATION

Preliminary Procedure: Remove top evaporator cover. (See paragraph 3-21.)

a. Removal

(1) Disconnect P2A, P3, P4, and P6 connector plugs.

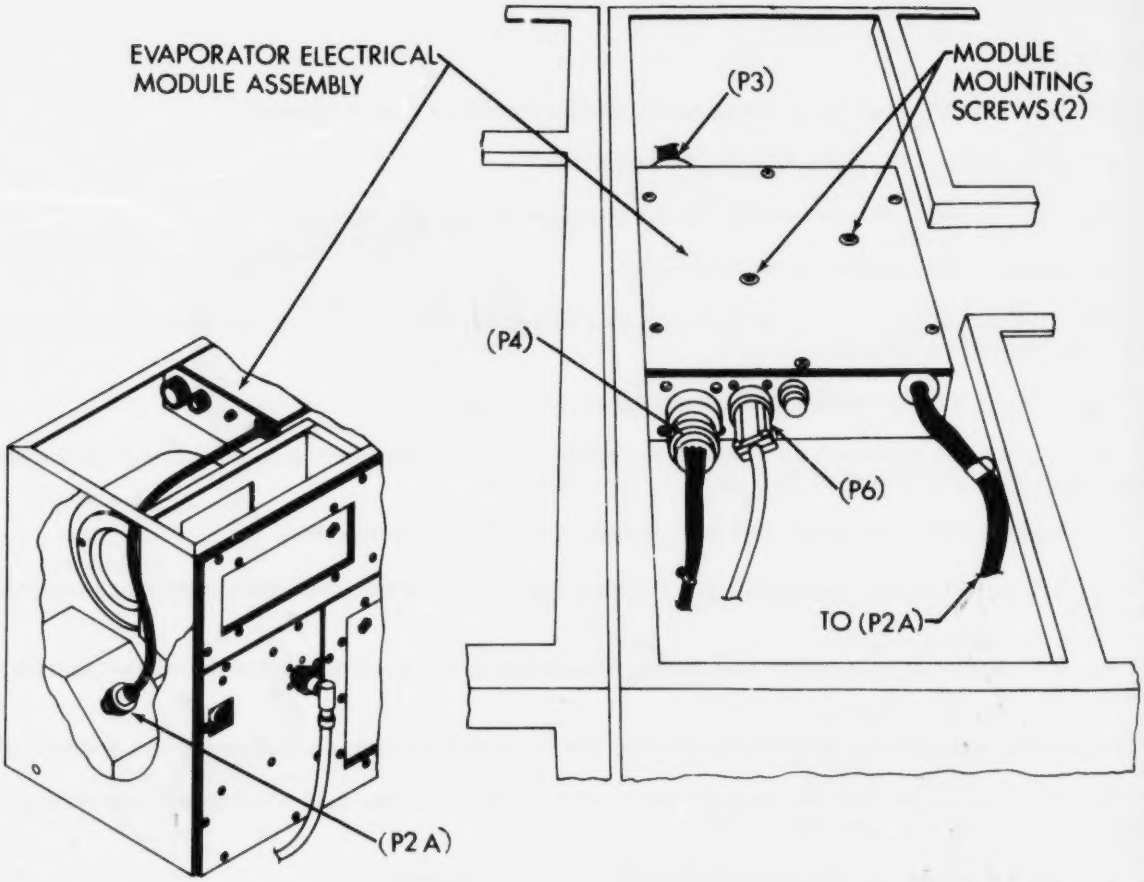

EVAPORATOR ELECTRICAL MODULE ASSEMBLY
(P3)
MODULE MOUNTING SCREWS (2)
(P4)
(P6)
TO (P2A)
(P2 A)
TS4120-359-14/4-13

Figure 4-13. Evaporator Electrical Module Assembly Removal/Installation

(2) Using screwdriver, loosen the two evaporator section electrical module mounting screws.

(3) Lift the electrical module up and out of the way.

(4) Using socket and ratchet, remove the eight hex head cap screws, lock washers, and flat washers from the front face of the fan assembly.

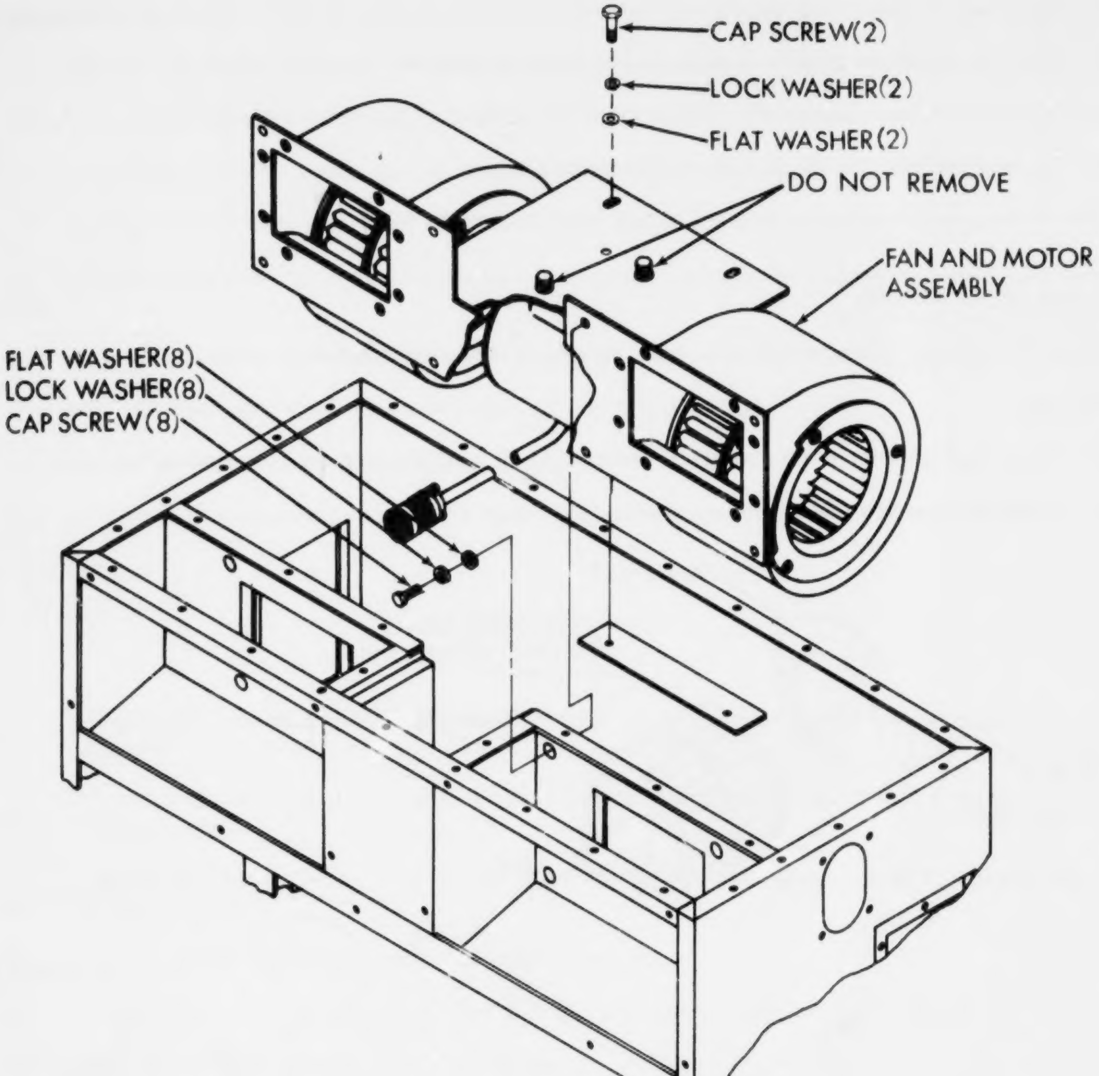


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Figure 4-14. Evaporator Fan and Motor Assembly

(5) Support the evaporator fan and motor assembly and remove the remaining two sets of hex head cap screws, lock washers, and flat washers from the rear shelf area.

(6) Carefully lift the evaporator fan and motor assembly up and out of the unit.

b. For individual component removal, testing, alinement, and repair see paragraphs 4-22 and 4-28.

c. Installation

(1) Carefully lower the evaporator fan and motor assembly down into the unit and aline the holes.

(2) Using socket and ratchet, secure with ten each hex head cap screws, lock washers, and flat washers.

(3) Place the electrical module in position and aline the module mounting screws.

(4) Using screwdriver, secure the module mounting screws.

(5) Connect the P2A, P3, P4, and P6 connector plugs.

Follow-on Procedure: Install top evaporator cover. (See paragraph 3-21.)

4-22. FAN INLET (RINGS)

Preliminary Procedure: Remove fan and motor assembly. (See paragraph 4-21.)

a. Inspect

(1) Check that fan inlet is not damaged. Replace if it is bent, badly dented, or cracked.

(2) Check that hardware is in place and secure.

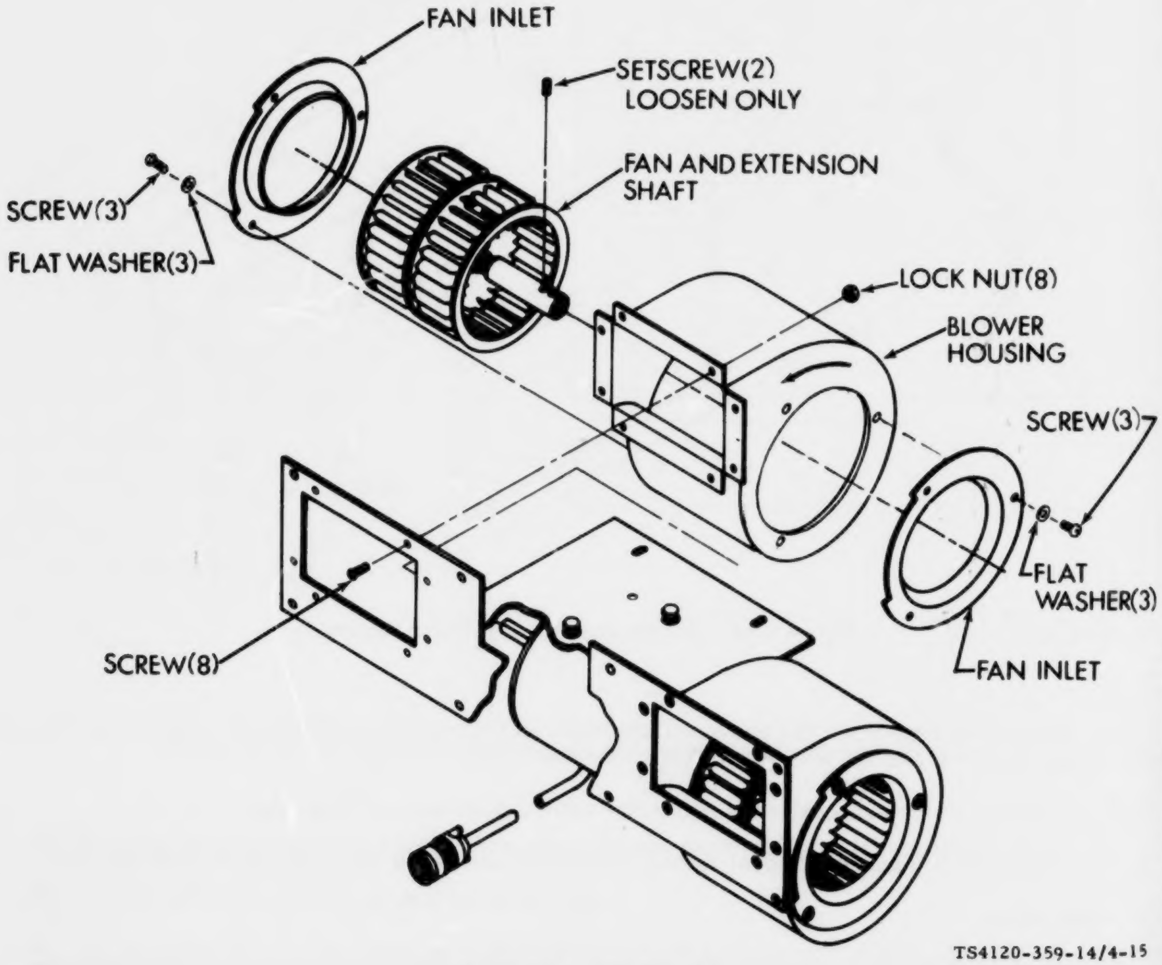

Figure 4-15. Fan Inlet

b. Removal

(1) Using screwdriver, remove three each screws and flat washers.

(2) Remove the outer fan inlet ring.

(3) Using allen wrench, loosen the two setscrews in the extension shaft.

(4) Slip the fan and extension shaft out of the blower housing.

(5) Using screwdriver and open end wrench, remove the eight screws and lock nuts from the blower housing.

(6) Remove the blower housing and the remaining fan inlet from the mounting plate.

(7) Using screwdriver, remove the three each screws and flat washer.

(8) Remove the fan inlet from the blower housing.

(9) Go back to step one, and remove the remaining two rings from the other blower housing.

c. Installation

CAUTION

Sheet metal screws are used to mount fan inlet rings. Take care that mounting screw holes are not stripped.

(1) Using screwdriver, install the inside fan inlet ring on the blower housing with three screws and flat washers.

(2) Using screwdriver and open end wrench, install the blower housing to the base flange with eight each screws and lock nuts.

(3) Slip the fan and extension shaft on to the motor shaft.

(4) Aline the flat portion of the motor shaft with the setscrews on the extension shaft.

(5) Using allen wrench, tighten the two setscrews.

(6) Spin the fan by hand to be sure there is no interference. If fan rubs, see paragraph 4-23 for fan alinement.

(7) Using screwdriver, install the outside fan inlet ring on the blower housing with three screws and flat washers.

(8) If the inlet rings were removed from the other fan, go back to step (1) and reassemble the other fan.

Follow-on Procedure: Install fan and motor assembly. (See paragraph 4-21.)

4-23. CENTRIFUGAL IMPELLER (FAN)

Preliminary Procedure: Remove fan and motor assembly. (See paragraph 4-21.)

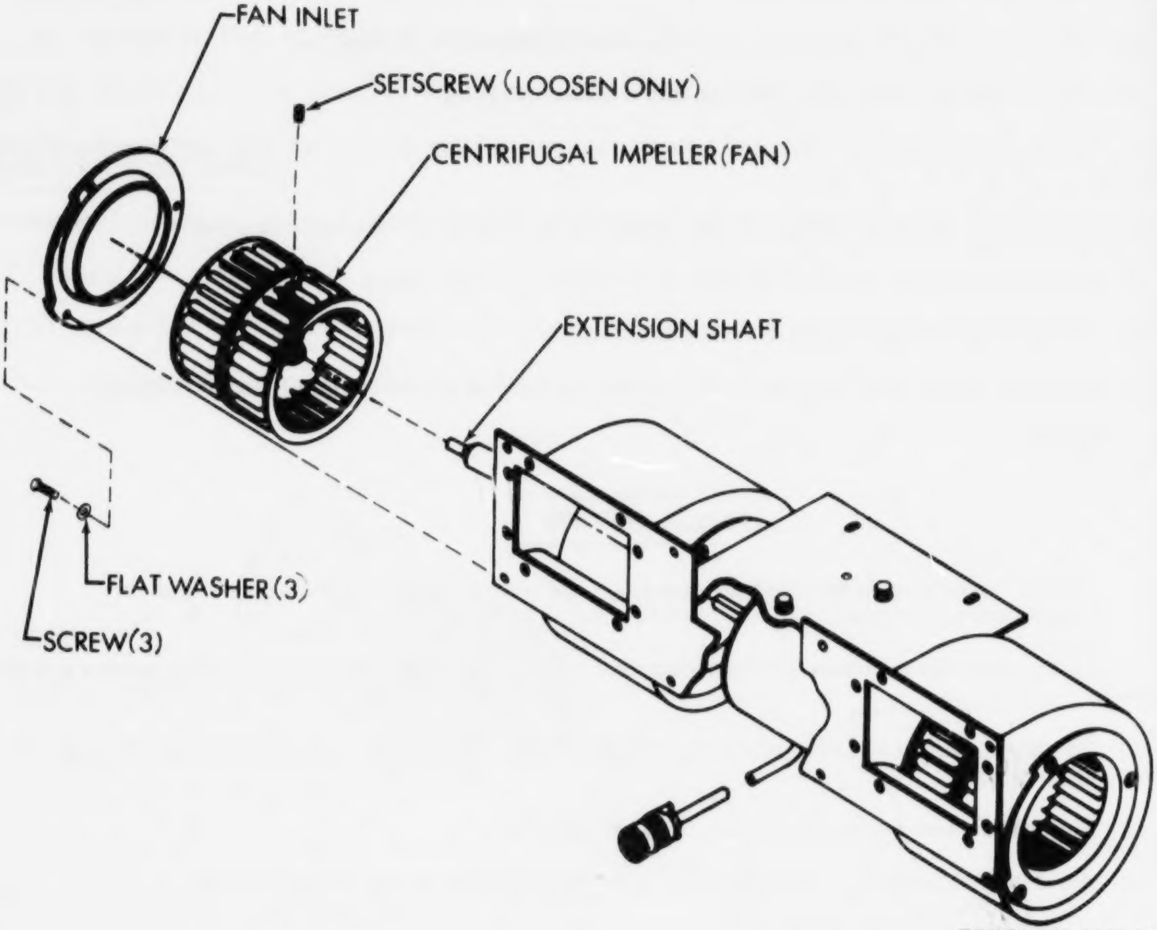

Figure 4-16. Centrifugal Impeller Fan

a. Removal

(1) Using screwdriver, remove three each screws and flat washers from outer fan inlet.

(2) Remove the outer fan inlet ring.

(3) Using allen wrench, loosen the two setscrews in the extension shaft.

(4) Slip the fan and extension shaft out of the blower housing.

(5) Using allen wrench, loosen the impeller setscrew.

(6) Slip the impeller from the extension shaft and out of the fan housing. If both impellers are to be removed, mark or tag them to avoid reversing the impellers.

(7) If the other fan is to be removed, go back to step 1.

b. Inspection

(1) Check that impeller is in good condition. Replace if it is out of round, dented, broken or if the hub is loose.

(2) Check to see that the setscrew is not missing.

(3) After the impellers are installed, check to see that the rotation is correct. (See figure 4-17 in installation instructions.)

c. Installation/Alinement

(1) Place blower assembly on a flat surface with discharge openings down and outside inlet rings and impellers removed.

(2) Aline impeller setscrew with flat surface on extension shaft.

(3) Slip impeller on extension shaft as far as possible and tighten setscrew.

(4) Be sure that the direction of rotation arrows on motor and fans agree. Take care that impellers are not reversed.

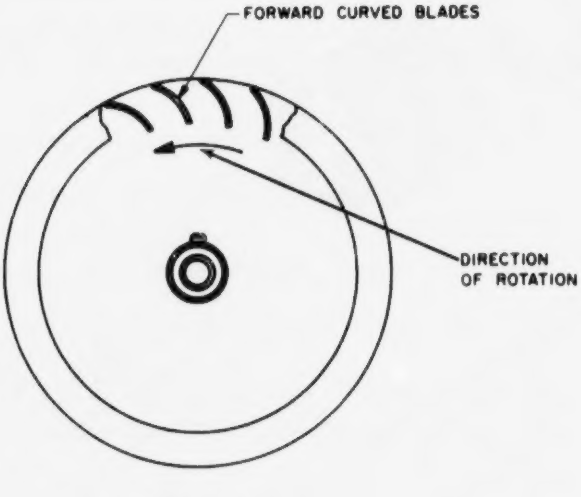

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Figure 4-17. Fan Impeller Direction of Rotation

(5) Slip impeller and extension shaft assembly on motor shaft.

(6) Install the outer fan inlet ring.

(7) Aline setscrews on extension shaft with flat surface on motor shaft.

(8) Position the impeller an *equal distance* between the two inlet rings.

(9) Using allen wrench, tighten the two setscrews.

(10) Spin the impeller by hand to check for interference. Should interference be noted, loosen setscrews and adjust fan. Retighten setscrews and repeat this step.

(11) If the other fan was removed, go back to step (1) and install it.

Follow-on Procedure: Install fan and motor assembly. (See paragraph 4-21.)

4-24. BLOWER HOUSING

Preliminary Procedure: Remove fan and motor assembly. (See paragraph 4-21.)

a. Inspect

(1) Check that blower housing is not damaged. Replace if it is bent, badly dented, or cracked.

(2) Check that hardware is in place and secure.

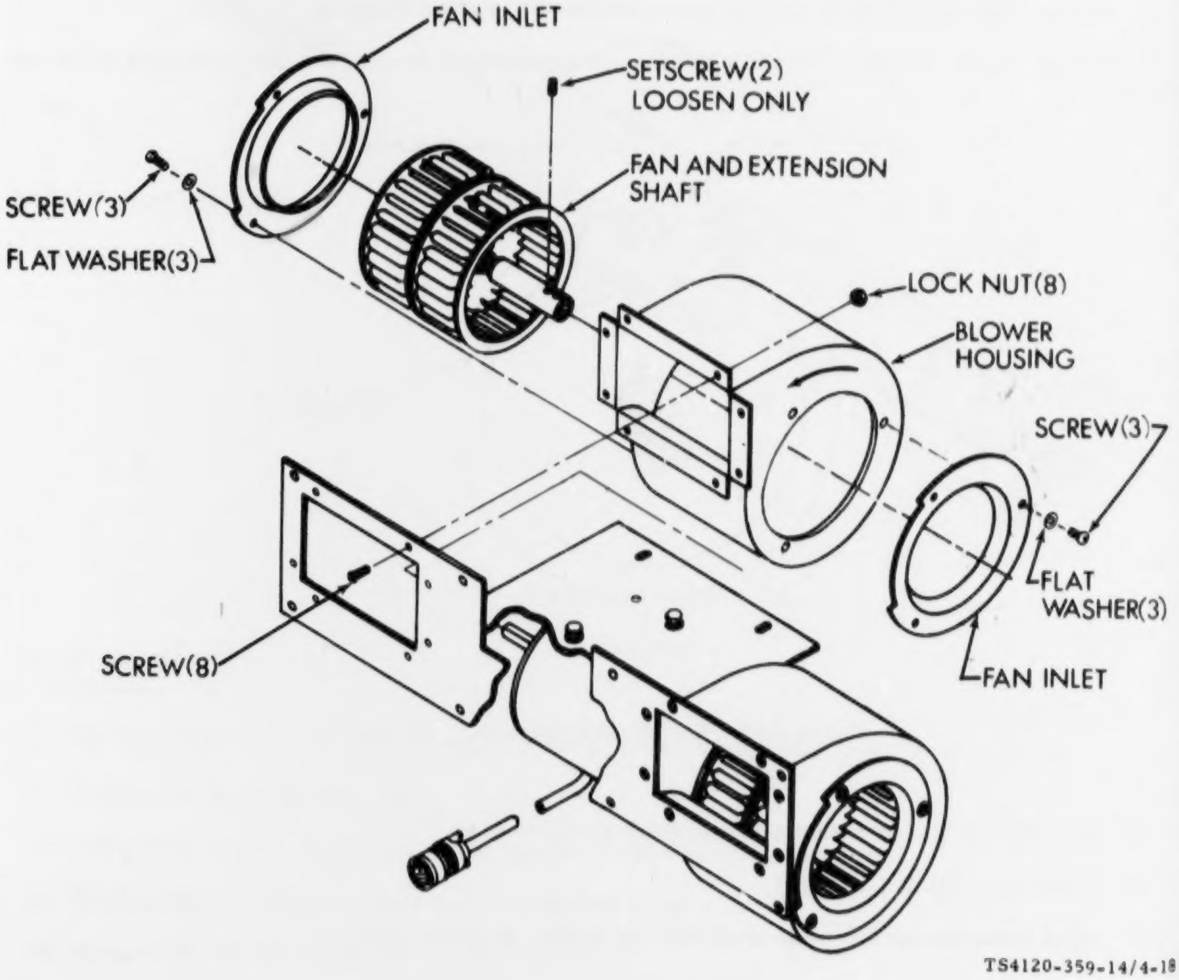

Figure 4-18. Blower Housing

b. Removal

(1) Using screwdriver, remove three each screws and flat washers, from outer fan inlet.

(2) Remove the outer fan inlet ring.

(3) Using allen wrench, loosen the two setscrews in the extension shaft.

(4) Slip the fan and extension shaft out of the blower housing.

(5) Using screwdriver and open end wrench, remove the eight screws and lock nuts from the blower housing.

(6) Remove the blower housing and the remaining fan inlet from the mounting plate.

(7) Using screwdriver, remove the three each screws and flat washers.

(8) Remove the fan inlet from the blower housing.

(9) Go back to step (1), and remove the remaining blower housing.

c. Installation

(1) Using screwdriver, install the inside fan inlet ring on the blower housing with three screws and flat washers.

(2) Using screwdriver and open end wrench, install the blower housing to the base flange with eight each screws and lock nuts.

(3) Slip the fan and extension shaft on to the motor shaft.

(4) Using screwdriver, install the outside fan inlet ring on the blower housing with three screws and flat washers.

(5) Aline the flat portion of the motor shaft with the setscrews on the extension shaft.

(6) Position the impeller an equal distance between the two inlet rings.

(7) Using allen wrench, tighten the two setscrews.

(8) Spin the fan by hand to be sure there is no interference. If fan rubs, see paragraph 4-23 for fan alinement.

(9) If the blower housing was removed from the opposite side, go back to step (1) and reassemble the other fan.

Follow-on Procedure: Install fan and motor assembly. (See paragraph 4-21.)

4-25. EXTENSION SHAFT

Preliminary Procedure: Remove fan and motor assembly. (See paragraph 4-21.)

Supplies: Abrasive cloth

a. Removal

(1) Using screwdriver, remove three each screws and flat washers from outer fan inlet ring.

(2) Remove the outer fan inlet ring.

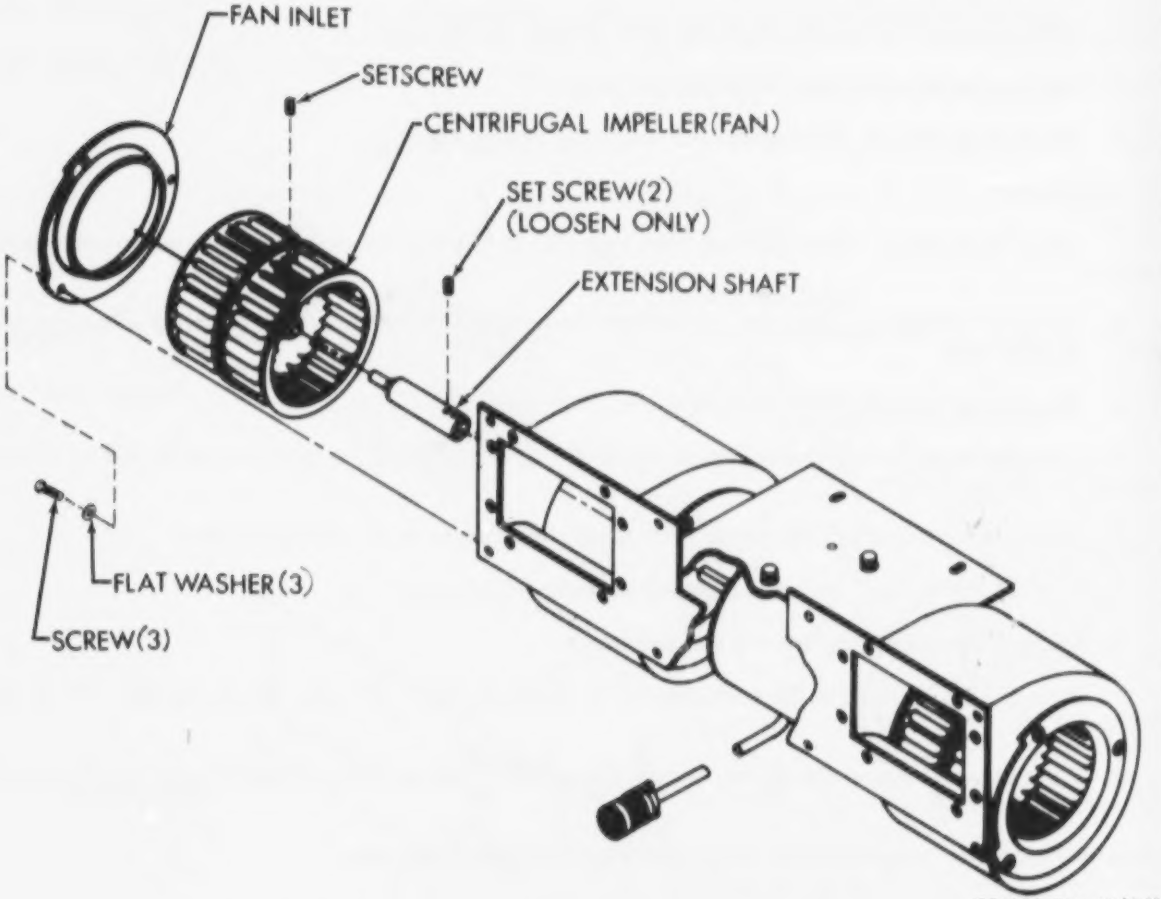

Figure 4-19. Extension Shaft

(3) Using allen wrench, loosen the two setscrews in the extension shaft.

(4) Slip the fan and extension shaft out of the blower housing.

(5) Using allen wrench loosen the setscrew in the impeller hub.

(6) Slip the impeller off the extension shaft. If the impeller does not come off the shaft easily, *do not hit or twist the impeller.* Impellers are easily damaged. Secure the free end of the extension shaft in a vice or similar tool. Using a screwdriver through the impeller setscrew access opening, place tip between impeller hub and extension shaft shoulder and twist screwdriver.

(7) If the extension shaft on the other fan is to be removed, go back to step (1).

b. Inspection/Repair

(1) Check that shaft is straight and not cracked or broken. Replace if damaged.

(2) Check that shaft is free of nicks and rough edges. Using abrasive cloth or hand file dress smaller nicks and rough edges or burrs off of shaft. Replace if nick cannot be removed by sanding or filing.

(3) Check that setscrews are not lost. Replace if missing.

c. Installation

(1) For installation/alinement, see paragraph 4-23.

(2) If the extension shaft was removed from the other fan, go back to step 1, and install the other extension shaft.

Follow-on Procedure. Install fan and motor assembly. (See paragraph 4-21.)

4-26. BASE, MOTOR, AND BLOWER

Preliminary Procedure: Remove fan and motor assembly. (See paragraph 4-21.)

a. Removal

(1) Using screwdriver and wrench, remove sixteen screws and lock nuts from the blower outlet flanges.

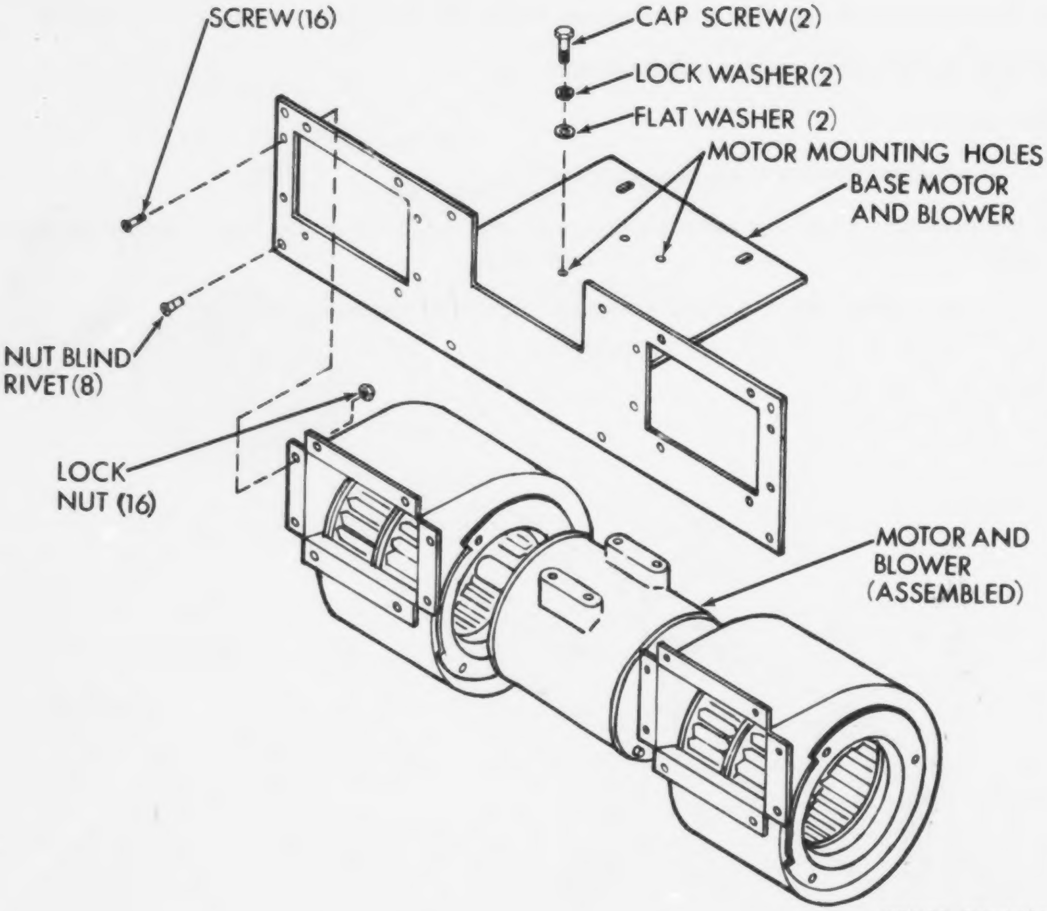

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Figure 4-20. Base, Motor, and Blower

(2) Support motor so that impellers will not be damaged.

(3) Using socket and ratchet, remove two each hex head cap screws, lock washers, and flat washers from the motor.

(4) Remove the base from the motor and blowers.

b. Inspect

(1) Check that base is not bent, dented, cracked, or punctured. Replace if damaged.

(2) Check that blind rivet nuts (rivnuts) are secure and threads not damaged. Replace the ones that are loose or damaged.

c. Repair

(1) Minor bends or dents can be repaired using standard sheet metal practices.

(2) Blind rivet nuts (rivnuts) can be replaced by drilling the old one out with a drill slightly smaller than the body diameter of the old nut. Then install a new one.

d. Installation

(1) Line up the holes in the base and motor.

(2) Using socket and ratchet, secure the motor to the base with two each hex head cap screws, lock washers, and flat washers. See figure 4-20 for holes to be used.

(3) Using screwdriver and wrench, secure the fan housings to the base with sixteen screws and lock nuts.

(4) Spin the fans by hand to be sure there is no interference. If fan rubs, see paragraph 4-23 for alinement.

Follow-on Procedure: Install fan and motor assembly. (See paragraph 4-21.)

4-27. EVAPORATOR BLOWER MOTOR INSPECTION/TEST (INSTALLED)

Preliminary Procedures:
1. Disconnect power.
2. Remove shelter to air conditioner rain shield.
3. Remove top evaporator cover. (See paragraph 3-21.)

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Test

(2) Remove connector plug P6 from connector J6.

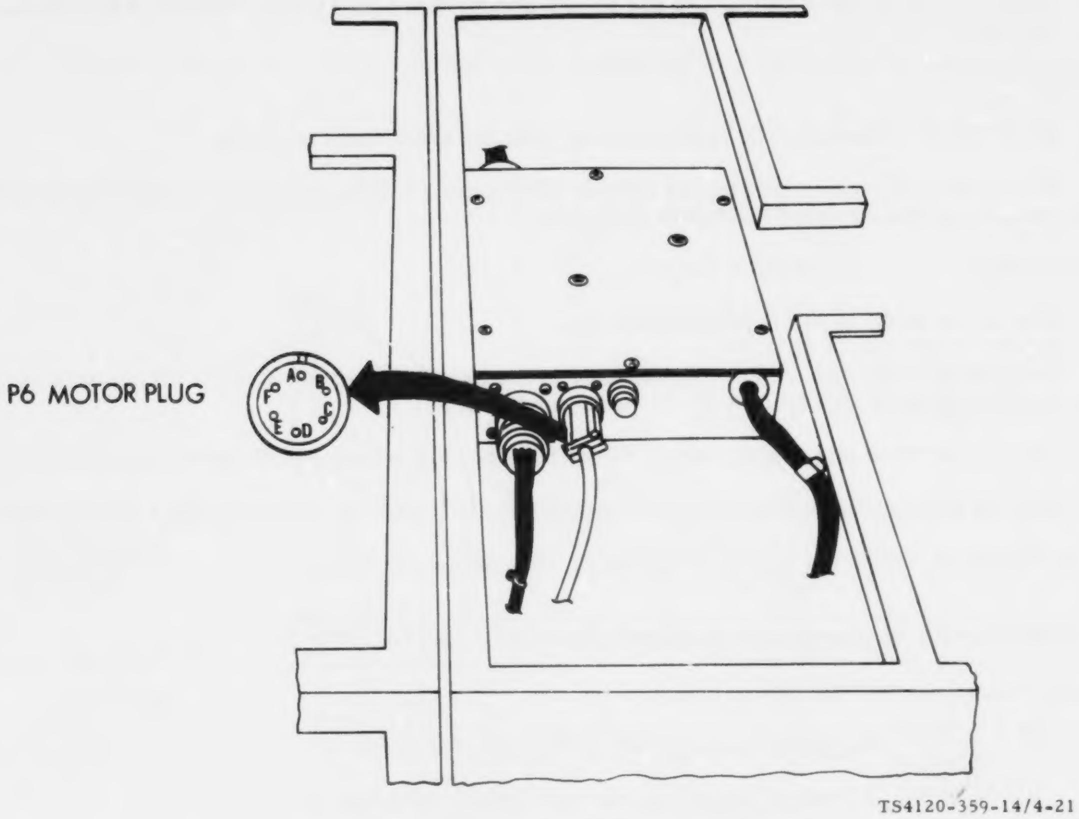

Figure 4-21. Motor (B3) Test Point

(2) Using multimeter, check all P6 pins for shorts. Pin D is *ground*. Check pins A, B, C, E, and F to pin D. There should be no reading. Check pin D to motor frame, multimeter should read 0.

(3) Using multimeter, check resistance of 3 phase motor windings at P6:

A to B

B to C

A to C

Resistances should all be above zero, but below 12 ohms.

(4) Using multimeter, check resistance between pins E and F. Resistance should be zero meaning thermostatic switch is closed.

(5) If motor fails any of the above tests, repair it.

b. Inspection

(1) Using hand, rotate impellers to check for interference. Impellers should spin freely. Repair as needed.

(2) Check that fans are tight on shafts. Repair as needed.

c. Reconnect the connector plug P6 to connector J6.

Follow-on Procedures: 1. Install the top evaporator cover. (See paragraph 3-21.)

2. Install the shelter to air conditioner rain shield.

4-28. MOTOR, ALTERNATING CURRENT (B3)

Preliminary Procedure: Remove fan and motor assembly. (See paragraph 4-21.)

a. Removal

(1) Support motor.

(2) Using allen wrench, loosen the four setscrews in the extension shafts.

(3) Using a screwdriver, remove three screws and flat washers and remove one of the outer fan inlet rings.

(4) Note position of rotation arrow on motor (for installation).

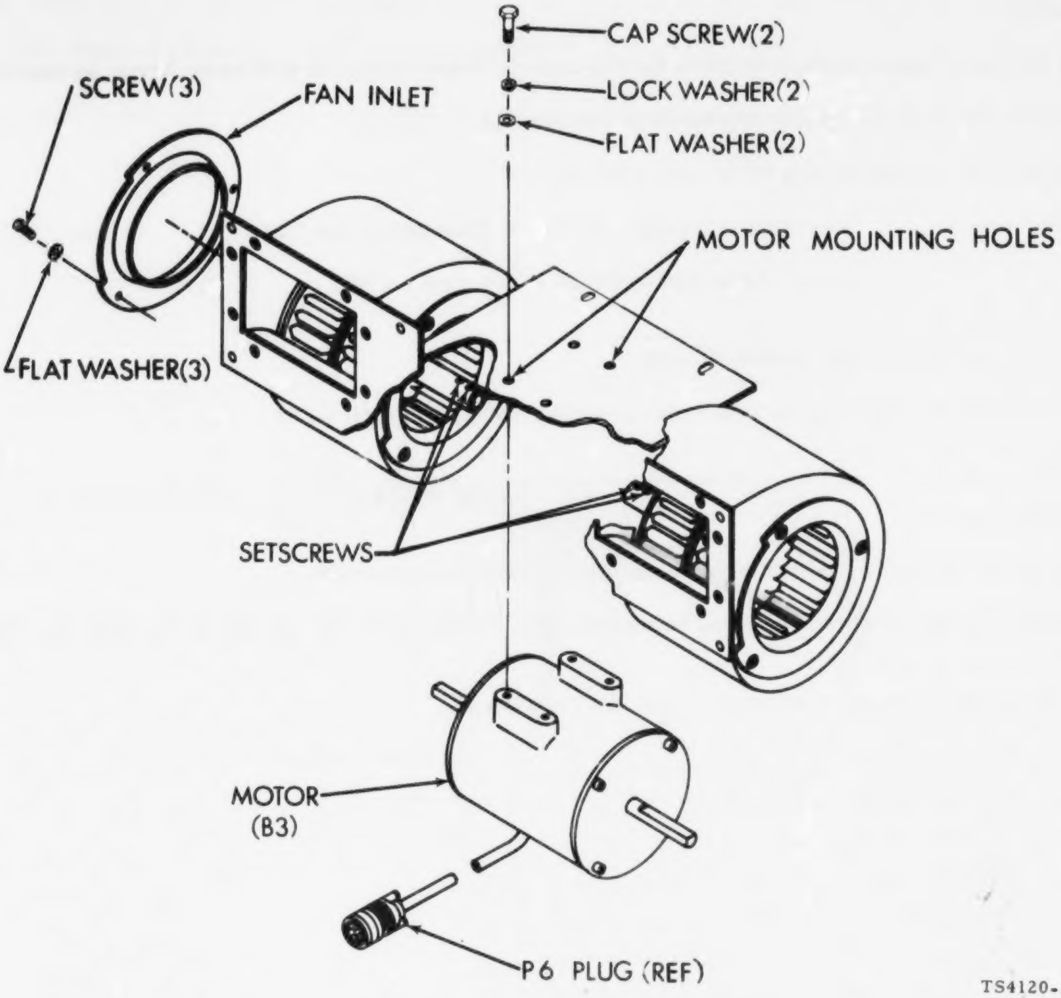

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Figure 4-22. Motor (B3)

(5) Using socket and ratchet, remove two hex head cap screws, lock washers and flat washers, and carefully remove the motor from the base and fans.

b. Test (See paragraph 4-27.)

c. Inspection

(1) Check motor to see that it rotates freely without excessive lateral end play.

(2) Check motor for visible evidence of overheating.

(3) Check connector plug P6 for loose, damaged, or missing pins.

d. Repair. Direct support maintenance repair of the evaporator fan motor is limited to the replacement of the electrical connector and the bearings. For further information on electric motor repair, refer to FM 20-31 (Electric Motor and Generator Repair).

(1) To replace the connector:

(a) Tag and unsolder leads.

(b) Remove the old connector.

(c) See wiring diagram and tags and solder leads to the new connector. Remove the tags.

NOTE

Motors manufactured by Welco Industries, Inc. do not come apart the same way as those manufactured by IMC Magnetics Corp. See motor name plate to determine who made the motor.

See figure 4-23 for disassembly of Welco motors.
See figure 4-24 for disassembly of IMC motors.

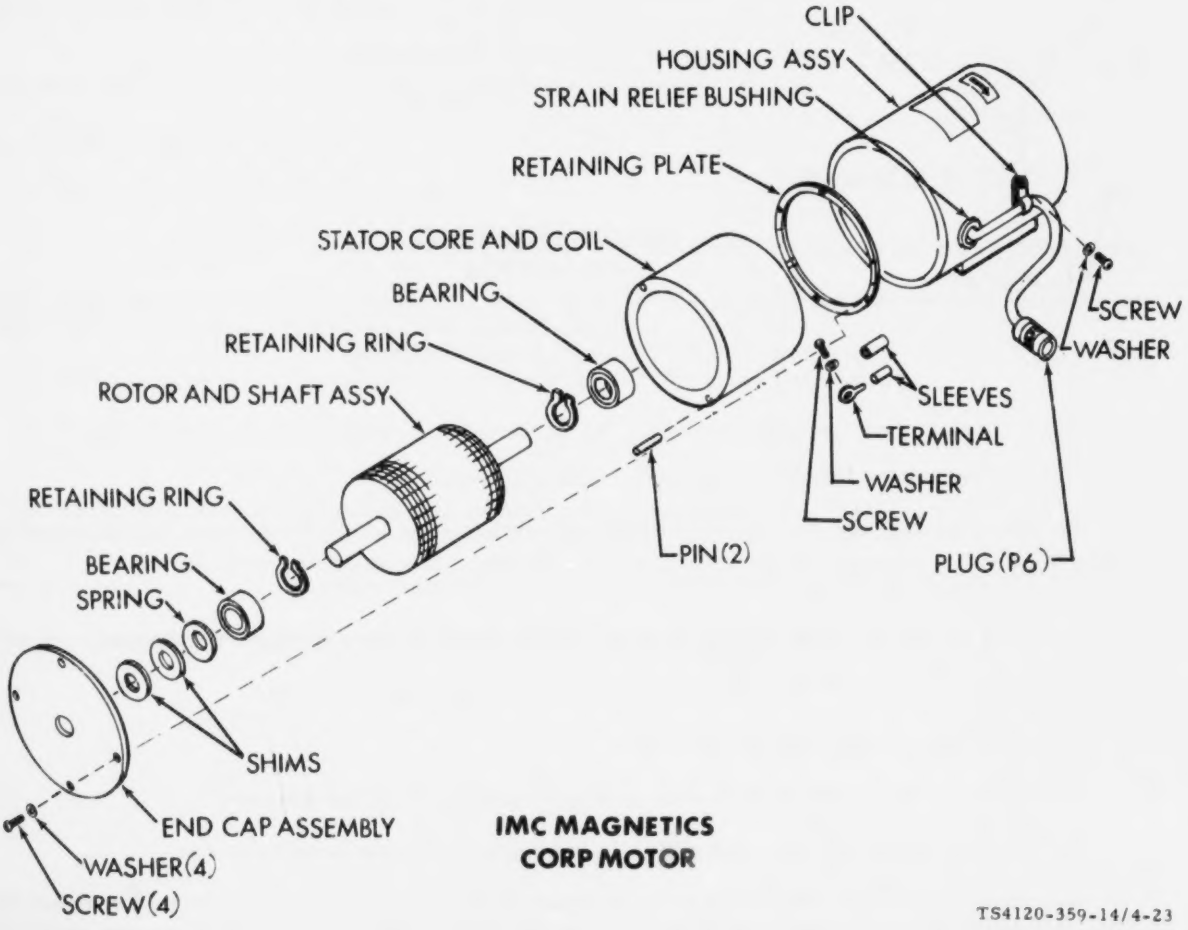

Figure 4-23. Motor (B3) IMC Magnetics

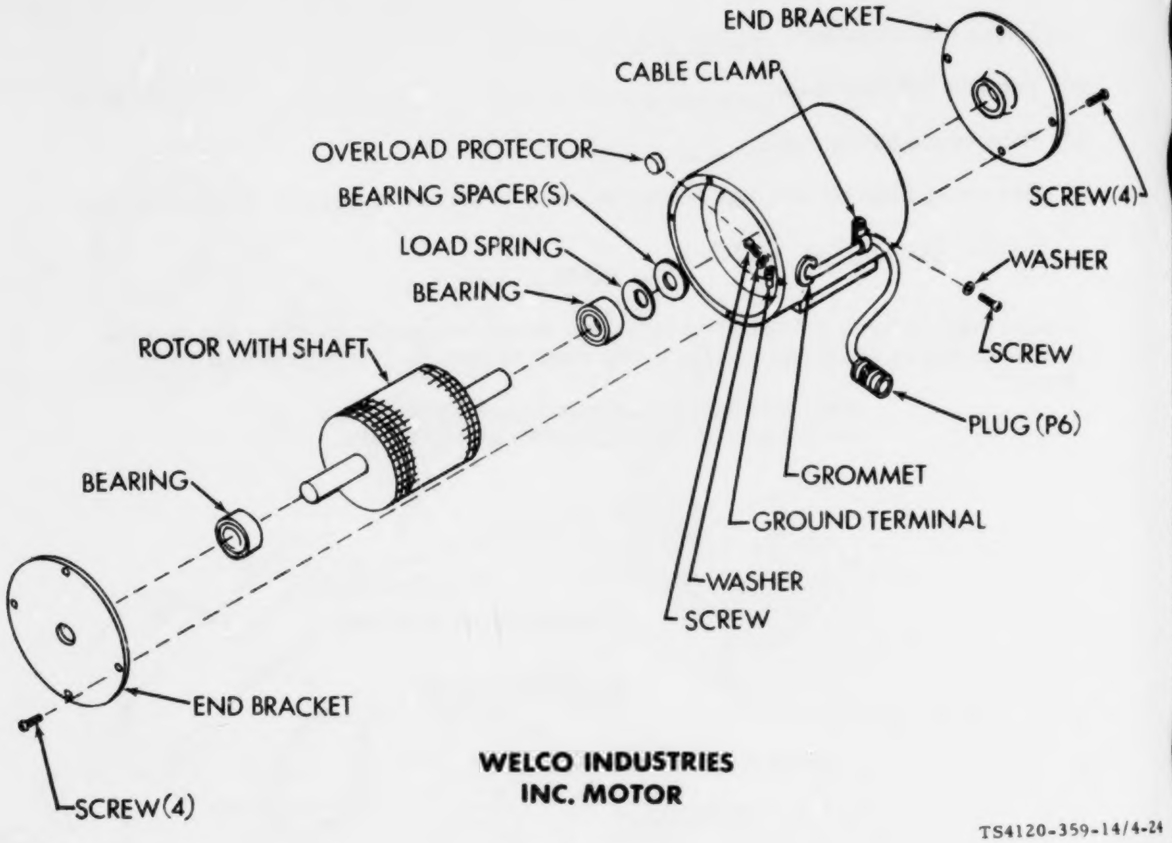

Figure 4-24. Motor (B3) Welco Industries

(2) To replace bearings on IMC Magnetics Corporation motors:

(a) Using screwdriver, remove four screws and washers and carefully remove the end cap assembly.

(b) Carefully pull the rotor and shaft assembly from the motor housing.

(c) Note the position and number of springs, shims, and bearings as they are removed.

(d) Remove the shim(s) and spring and pull the bearings from the shafts.

(e) Place the new bearings on the shafts.

(f) Place the spring and shim(s) back on shaft in same position as removed.

(g) Carefully place the rotor and shaft with bearings back in the motor housing.

(h) Using screwdriver, secure the end cap assembly to the housing assembly with four screws and washers. Before tightening completely, spin shaft to see that it spins freely. If any rubbing is noted, adjust the end cap slightly to relieve rubbing. Finish tightening the four screws.

(i) Check end-play of shaft. End play should be 0.002-0.005 inch (0.051-0.127 mm). If end-play is not within limits, disassemble motor and add or remove shims to adjust.

(3) To replace bearings on Welco Industries, Inc. motors:

(a) Using screwdriver, remove four screws from each end bracket and carefully remove the end brackets.

(b) Note the position and number of springs, shims, and bearings as they are removed.

(c) Remove the bearing spacer(s) and load spring.

(d) Remove the bearings.

(e) Place the new bearings on the shafts.

(f) Place the spring and shim(s) back on shaft in same position as removed.

(g) Carefully place the rotor and shaft with bearings back in the motor housing.

(h) Using screwdriver, secure the end brackets to the motor with eight screws and washers. Before tightening completely, spin shaft to see that it spins freely. If any rubbing is noted, adjust the end brackets slightly to relieve rubbing. Finish tightening the eight screws.

(i) Check end play of shaft. End play should be 0.002.0-0.005 inch (0.051-0.127 mm). If end play is not within limits, disassemble motor and add or remove shims to adjust.

e. Installation (See figure 4-22.)

(1) Be sure the motor rotation is correct.

(2) Carefully slip motor into place with impellers and extension shafts loosely placed on motor shafts.

(3) Using socket and ratchet, secure the motor to the base with two each hex head cap screws, lock washers, and flat washers. See figure 4-20 for holes to be used.

(4) Using a screwdriver, install fan inlet ring with three screws and flat washers.

(5) Check to see that the impellers are located an equal distance between the two walls of the blower housing.

(6) Using allen wrench, tighten the four extension shaft setscrews.

(7) Spin the impeller by hand to check for interference. If impellers rub, see paragraph 4-23, for alinement instructions.

Follow-on Procedure: Install fan and motor assembly. (See paragraph 4-21.)

4-29. THERMOSTATIC SWITCHES (S2 and S3)

Preliminary Procedure: 1. Disconnect power.

2. Remove top evaporator cover. (See paragraph 3-21.)

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Test

NOTE

Test switch when the temperature *is below* 100°F (38°C).

(1) Tag leads, using screwdriver, remove four screws that hold leads to switch. (There are two switches.)

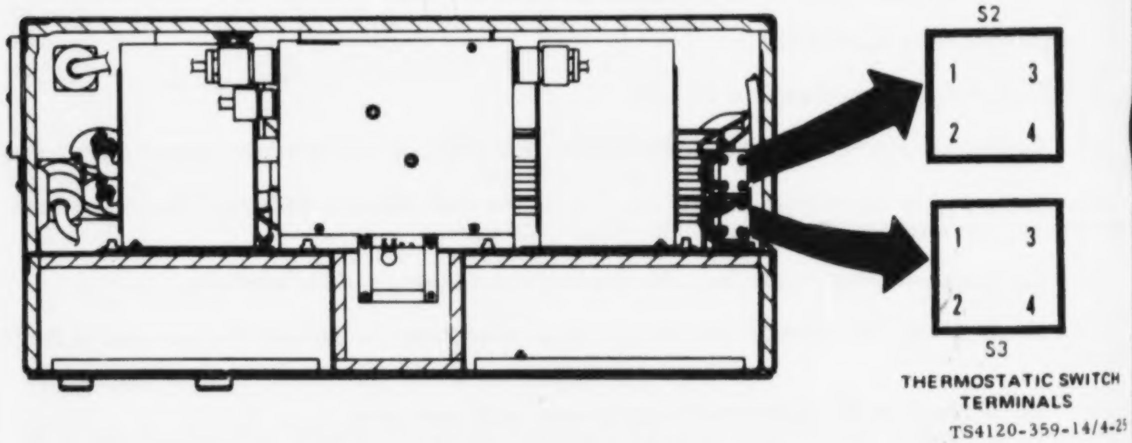

Figure 4-25. Thermostatic Switch Test

(2) Test for continuity between switch terminals 1 and 2 and between 3 and 4. If none, switch should be replaced.

NOTE

Switch contacts should open at 145 - 155°F (63 - 68°C) and close when temperature drops to 100 - 120°F (38 - 49°C).

b. Removal

(1) Using screwdriver, tag and remove leads from thermostatic switch.

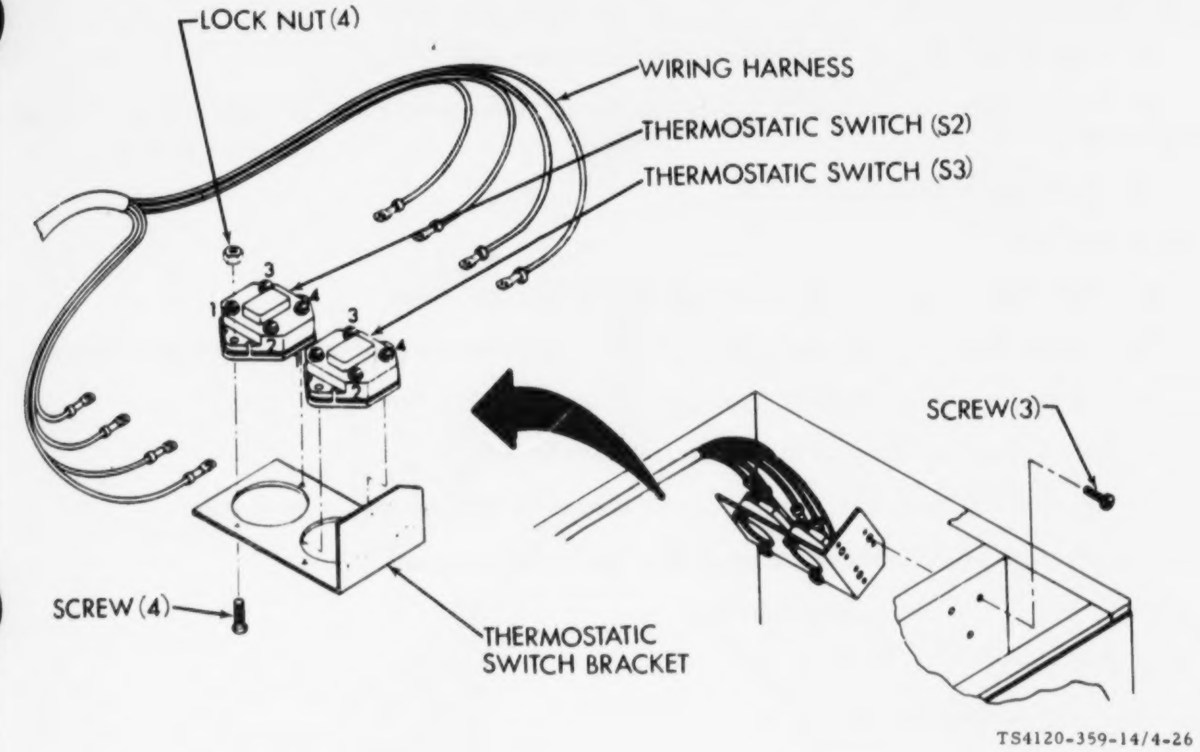

Figure 4-26. Thermostatic Switches (S2 and S3)

(2) Using stubby screwdriver, remove the three screws that hold the thermostatic switch bracket.

(3) Remove the switches and bracket from the unit.

(4) Using screwdriver and wrench, remove two each screws and lock nuts from each of the thermostatic switches.

(5) Remove the switches from the bracket.

c. Inspect/Bench test

(1) Inspect for cracks, loose connections, and obvious damage. Replace, if defective.

(2) Tape the bulb of a thermometer or junction of a thermocouple to the body of a thermostatic switch, and connect the multimeter to terminals one and two. Use a 150 watt bulb or a heat source. Gradually apply heat while observing both the thermometer and the multimeter. Continuity should drop out at 145 to 155°F (63 to 68°C). Remove heat source and let the thermostat cool while observing the thermostat and multimeter. Continuity should be re-established at 100 to 120°F (38 to 49°C).

(3) Repeat step (2) with meter connected to terminals 3 and 4.

(4) If the thermostatic switch does not meet the above requirements, replace it.

(5) Check condition of thermostatic switch bracket. Replace the bracket if it is badly bent, cracked, or otherwise damaged. If the rivets or plate nuts are loose, missing, or damaged, repair or replace them.

d. Repair (bracket only)

(1) Repairs are limited to replacement of rivets and plate nuts.

(2) Plate nut may be removed by drilling out the old rivets using a drill bit slightly smaller than the diameter of the rivet.

(3) Install new plate nut(s) and rivets.

e. Installation

(1) Place thermostatic switches on bracket and line up screw holes.

(2) Using screwdriver and wrench, attach switches to bracket with two each screws and lock nuts.

(3) See tags and wiring diagram, figure 4-3, and connect leads. Remove the tags.

(4) Line up bracket with holes in evaporator section housing.

(5) Using stubby cross tip screwdriver, install bracket on housing using three screws.

Follow-on Procedures:
1. Install top evaporator cover. (See paragraph 3-21.)
2. Connect power.

4-30. TERMINAL BOARD (TB2) AND TERMINAL BOARD SUPPORT

Preliminary Procedure: Remove fan and motor assembly. (See paragraph 4-21.)

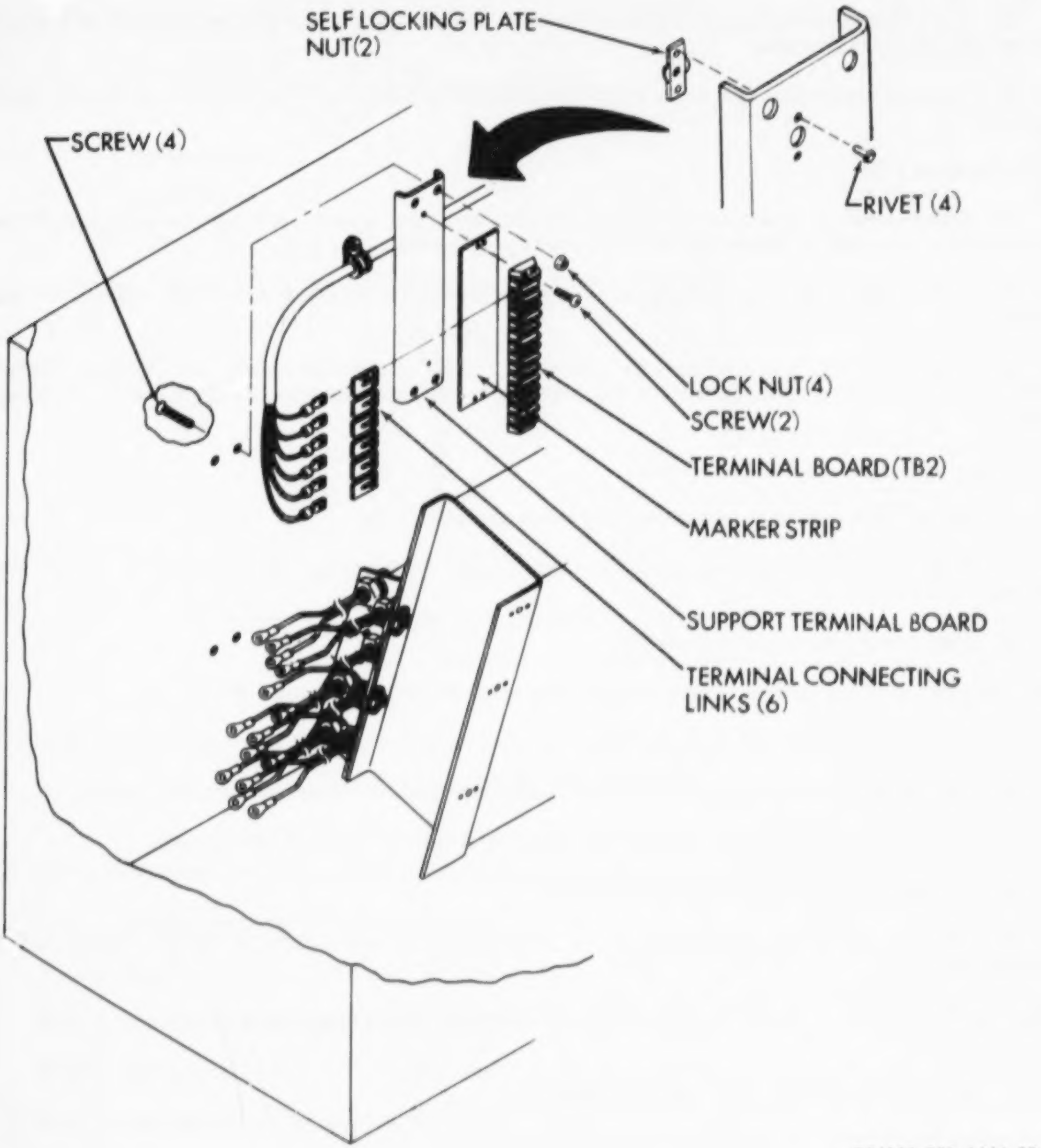

Figure 4-27. Terminal Board and Support

a. Removal

(1) Using screwdriver, tag and disconnect leads from heaters and wiring harness.

(2) Disconnect six terminal connecting links.

(3) Using screwdriver, remove two screws that hold terminal board.

(4) Remove the terminal board and marker strip.

(5) If the terminal board support is to be removed, see paragraph 4-14 and separate the evaporator and condenser section assemblies.

(6) Using screwdriver and wrench, remove the four screws and lock nuts and remove the terminal board support.

b. Inspection

(1) Check terminal board for loose or corroded terminals, cracks, and obvious damage. Replace if terminals are corroded, or if terminal board is cracked or broken.

(2) Check marker strip for general condition. Replace if it is cracked, broken, or you can not read the numbers.

(3) Check terminal board support for cracks and loose or damaged plate nuts or rivets. Replace the support if it is cracked or broken. Replace the rivets if they are loose. Replace the plate nut if it is damaged or missing.

c. Repair (terminal board support only)

(1) Repairs are limited to replacement of rivets and plate nuts.

(2) Plate nut may be removed by drilling out the old rivets using a drill bit slightly smaller than the diameter of the rivet.

(3) Install new plate nut(s) and rivets.

d. Installation (If the terminal board support was not removed, skip steps 1 and 2.)

(1) Using screwdriver and wrench, install the terminal board support with four screws and lock nuts.

(2) See paragraph 4-14 and reconnect the evaporator and condenser section assemblies.

(3) Using screwdriver, install the terminal board and marker strip with two screws.

(4) Connect the six terminal connecting links.

(5) See tags and wiring diagram, figure 4-3, and connect the leads from the heaters and wiring harness. Remove the tags.

Follow-on Procedure: Install the fan and motor assembly. (See paragraph 4-21.)

4-31. HEATING ELEMENT TEST (INSTALLED)

Preliminary Procedure: 1. Disconnect power.

2. Remove top evaporator cover. (See paragraph 3-21.)

a. Test

(1) Remove heater wiring harness connector P3 from connector J3 on right side of electrical module assembly.

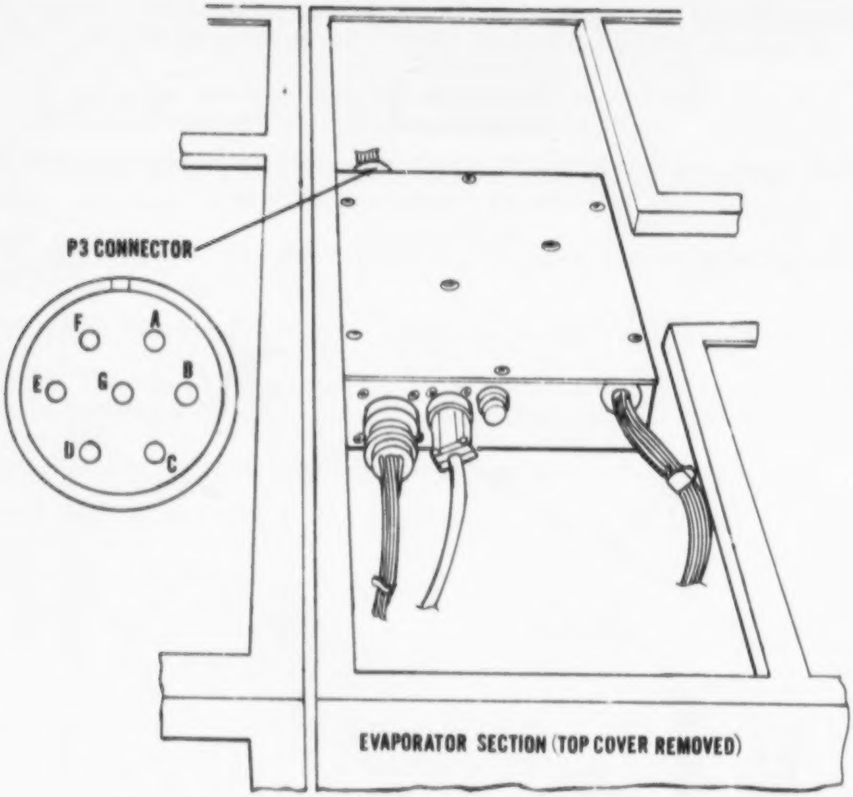

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Figure 4-28. Heater Test (Installed)

(2) Using multimeter, measure resistance between pins in P3 connector: (Pin G is not used.)

A to C, Resistance should be 13 to 19 ohms.

A to B, Resistance should be 13 to 19 ohms.

B to C, Resistance should be 13 to 19 ohms.

D to E, Resistance should be 20 to 26 ohms.

D to F, Resistance should be 20 to 26 ohms.

E to F, Resistance should be 20 to 26 ohms.

(3) If any of the above tests show a failure proceed to paragraph 4-32.

Follow-on Procedures:

1. Install top evaporator cover. (See paragraph 3-21.)
2. Connect power.

4-32. HEATING ELEMENTS, (HR1 THROUGH HR15) INSULATING GROMMET AND BRACKET

Preliminary Procedure: Remove fan and motor assembly. (See paragraph 4-21.)

WARNING

Allow heaters to cool before touching. Severe burns can result from touching hot heaters.

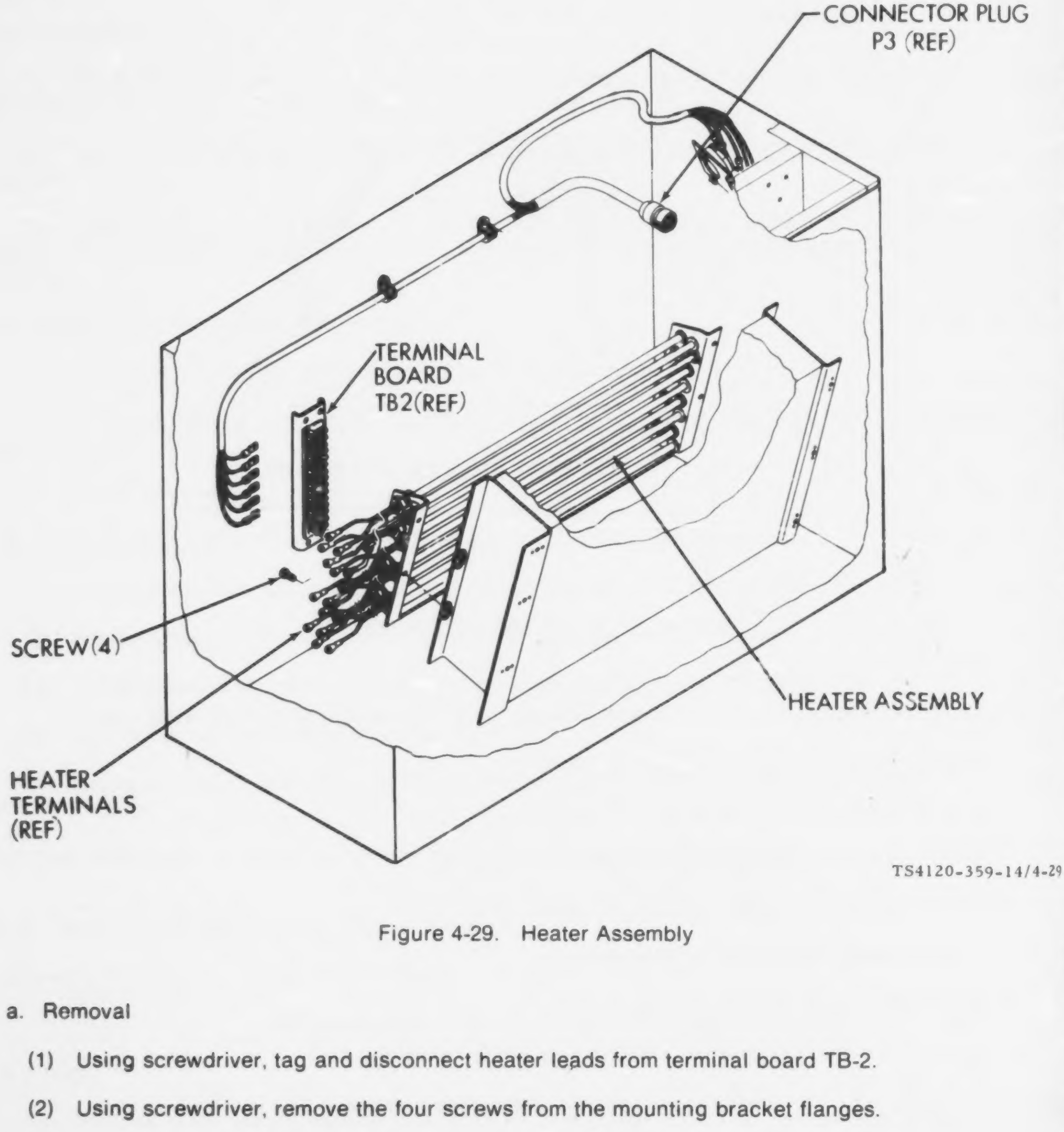


Figure 4-29. Heater Assembly

a. Removal

(1) Using screwdriver, tag and disconnect heater leads from terminal board TB-2.

(2) Using screwdriver, remove the four screws from the mounting bracket flanges.

(3) Carefully lift the heater assembly up and out of the unit.

b. Inspect/Test prior to disassembly

(1) Visually inspect each heater for obvious damage, deformation, cracked or broken sheath, burnt out spots and loose, broken or otherwise damaged leads. Replace if any damage is found.

(2) Using a multimeter, check the resistance of each heating element. Resistance should be 67 to 75 ohms. Replace heating elements that do not indicate proper resistance.

(3) Using a multimeter, check each heating element for shorts. Check between heater wire and heater body. No reading should be indicated. Replace heating elements that indicate shorts.

(4) Check that heater isolation grommets are not damaged or missing. Replace them if they are badly burnt or missing.

(5) Check heater mounting bracket for cracks, breaks, and severe dents. Replace if damaged.

c. Disassembly. The following disassembly instructions cover removal of only one heater. Should more than one or all of the heaters have to be removed, repeat steps listed for each heater to be removed.

(1) Using wrench, remove nut from threaded end of heater.

(2) Carefully slip nut, lock washer, and washer over and off of leads.

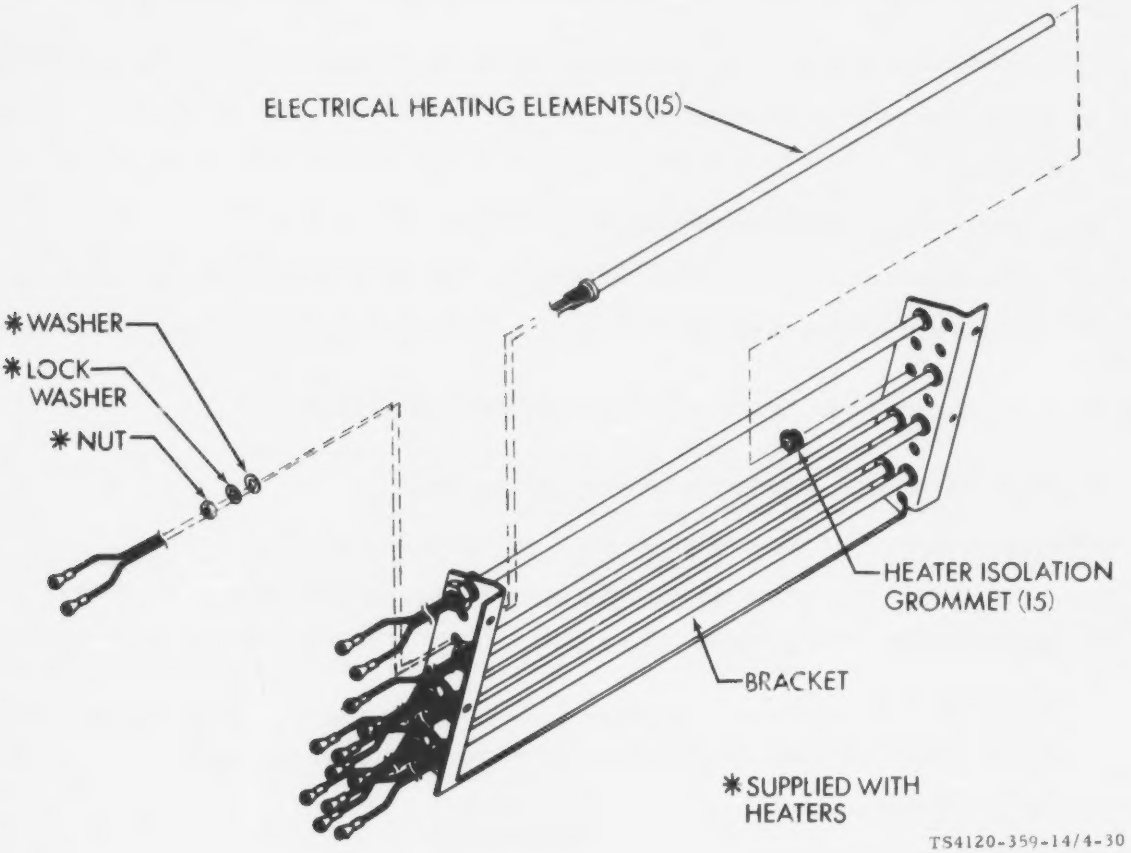


Figure 4-30. Electrical Heating Elements

(3) Slip heater toward isolation grommets far enough to pull leads through heater mounting hole. Take care that leads are not damaged if heater is to be reinstalled.

(4) Slip heater to the side and pull it away from the isolation grommet.

(5) If isolation grommet is to be replaced, remove it.

(6) If heater mounting bracket is to be replaced, remove all fifteen heaters and isolation grommets.

d. Reassembly

(1) Install new isolation grommet, if needed.

NOTE

When installing new heaters, the nut, lock washer, washer, and insulating washer are provided with the heater. This hardware will have to be removed prior to step (2). Discard insulating washer.

(2) Slip the smooth end of the heater through the isolation grommet far enough that leads can be placed through the matching hole on the opposite side of the bracket.

(3) Carefully slide the leads and the threaded end of the heater into the matching hole opposite the grommet.

(4) Carefully slip the washer, lock washer, and nut over the leads and onto the threaded heater end.

(5) Using wrench secure the heater nut.

e. Installation

(1) Carefully slip the heater assembly down into the unit.

(2) Using screwdriver, secure the heater assembly to the flanges of the evaporator coil with four screws.

(3) See tags and wiring diagram, figure 4-3, and connect heater leads at terminal block TB-2. Remove the tags.

Follow-on Procedure: Install the fan and motor assembly. (See paragraph 4-21.)

4-33. EVAPORATOR COIL INSPECTION INSTALLED/CLEANING

Preliminary Procedure: 1. Remove return air screen and frame. (See paragraph 3-18.)

2. Remove fan and motor assembly. (See paragraph 4-21.)

Tools: Plastic fin comb

Soft bristled brush

Vacuum cleaner with brush attachment or low pressure compressed air source

Safety glasses or goggles

a. Inspection of installed items

(1) Check for accumulated dirt. Clean if an accumulation of dirt is evident.

(2) Check fins for dents, bent edges, or any condition that would block or distort air flow. Straighten all damaged fins with a plastic fin comb.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm^2).

CAUTION

Do not use steam to clean coil.

b. Cleaning. Clean coil with a soft bristled brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi or less from the inside of the coil to blow the dirt out. Take care to avoid fin damage. When using compressed air wear safety glasses or goggles. Dirt can be blown into your eyes.

c. Repair/Replacement. Should a leak or major damage be evident, go to paragraph 4-34.

Follow-on Procedures:
1. Install fan and motor assembly. (See paragraph 4-21.)
2. Install return air screen and frame. (See paragraph 3-18.)

4-34. EVAPORATOR COIL

For inspection installed/cleaning, see paragraph 4-33.

Preliminary Procedures:
1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove return air screen and frame. (See paragraph 3-18.)
3. Remove access cover. (See paragraph 3-14.)
4. Remove front evaporator cover and radio frequency filter. (See paragraphs 3-17 and 4-17.)
5. Remove the heater assembly. (See paragraph 4-32.)
6. Discharge the refrigerant system. (See paragraph 4-5.)

a. Removal

(1) Using screwdriver, remove the three screws that hold the three clamps that support the expansion valve and expansion valve capillary line.

(2) Using wrench, carefully disconnect the low and high condenser to evaporator refrigerant metal hose line connectors from the coupling halves. (See figure 4-8.)

(3) Using wrench, remove the two each jam nuts and gasket seals from the inside of the access area.

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage on the coil.

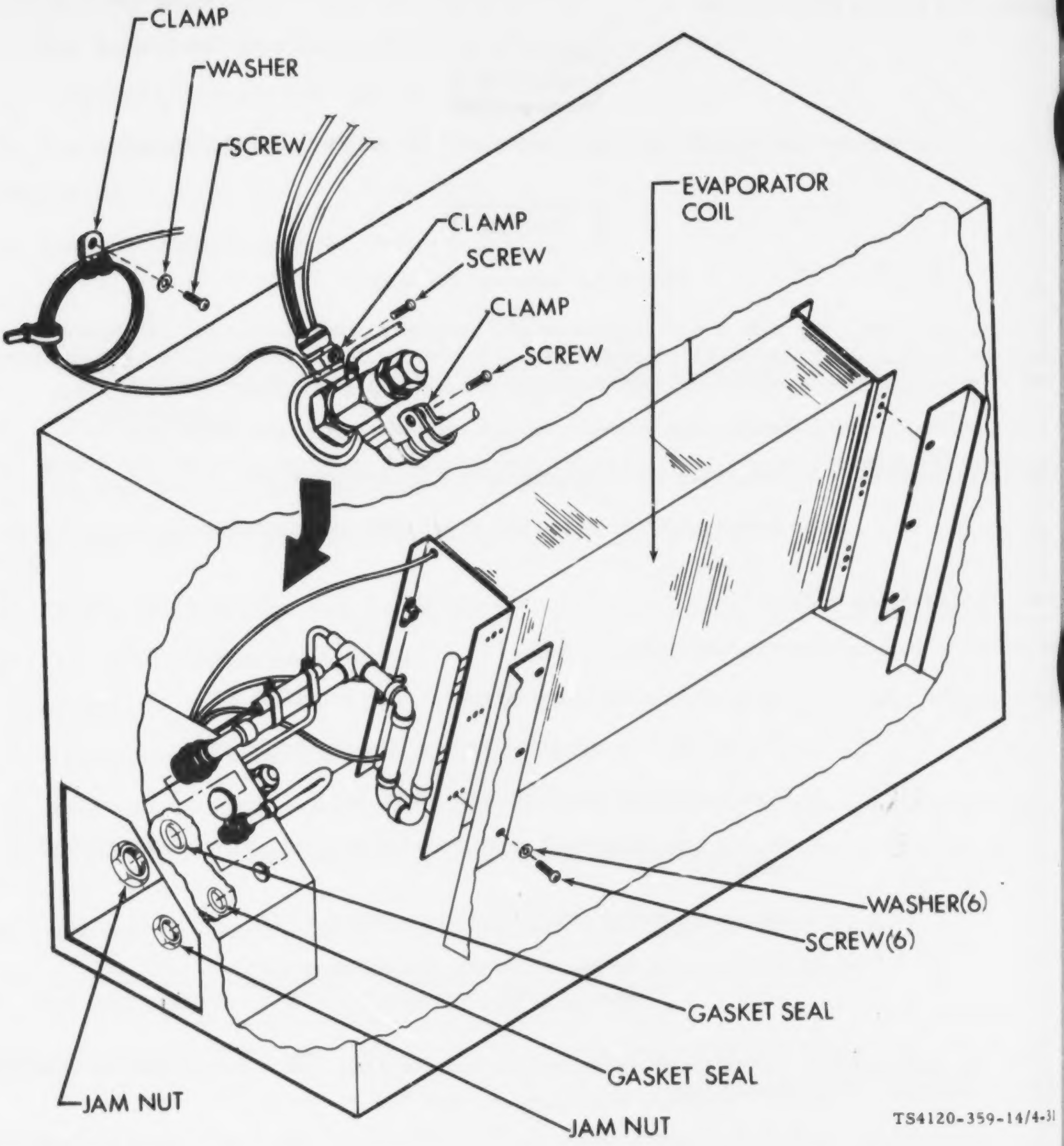


Figure 4-31. Evaporator Coil and Tubing Removal/Installation

(4) Using screwdriver, remove six screws and washers while supporting the evaporator coil.

(5) Using gloves to protect your hands and coil fins, carefully lift the coil and tubing up and out of the unit.

WARNING

REFRIGERANT UNDER PRESSURE
is used in the operation of this equipment
DEATH
or severe injury may result if you fail to observe safety precautions.

Never use a heating torch on any part that contains Refrigerant 22.

Do not let liquid refrigerant touch you, and do not inhale refrigerant gas.

b. Disassembly

(1) Be sure refrigerant has been discharged. (See paragraph 4-5.)

(2) Tubing should be nitrogen purged during all brazing/debrazing operations. (See paragraph 4-6.)

(3) Unwrap insulation (black cork tape) from joints that are to be debrazed.

(4) Wrap wet rags around expansion valve body and distributor tubes.

(5) Using torch debraze and separate the distributor from the expansion valve. See paragraph 4-7.

(6) Note position of elbow on suction header.

(7) Wrap wet rags around suction header on evaporator coil, just above the elbow.

(8) Using torch, debraze and separate the elbow from the evaporator coil header. See paragraph 4-7.

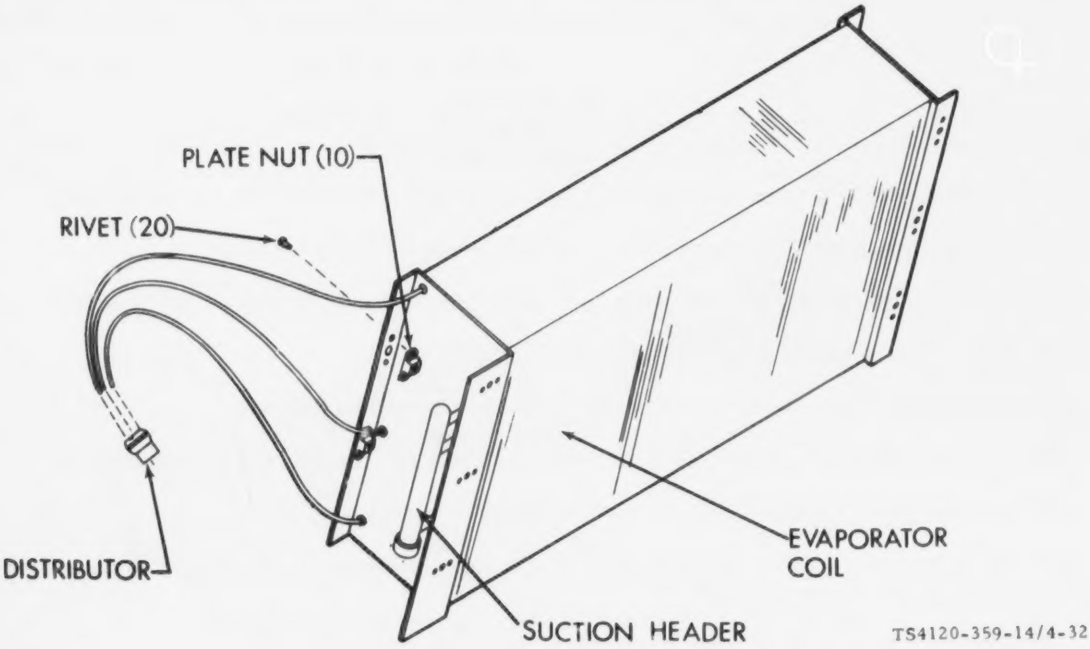


Figure 4-32. Evaporator Coil Repair

c. Repair

(1) Repairs are limited to replacement of distributor, rivets, plate nuts, and the straightening of mashed fins.

(2) Plate nuts may be removed by drilling out the old rivets using a drill bit slightly smaller than the diameter of the rivet.

(3) Install new plate nut(s) and rivets.

(4) If fins are mashed or dented so that the air flow across the coil would be blocked, straighten them using a plastic fin comb.

(5) To replace the distributor, debraze the distributor from the three distributor lines. Braze the new distributor to the three lines. Check to be sure that all three lines are clear and not blocked internally with solder or flux.

d. Reassembly/Installation

(1) Tubing should be nitrogen purged during all brazing/debrazing operations.

(2) Place distributor in expansion valve.

(3) Wrap wet rags around expansion valve body and distributor tubes.

(4) Using torch, braze distributor to expansion valve joint in accordance with paragraph 4-7.

(5) Wrap wet rags around evaporator coil header.

(6) Using torch, braze elbow in place on header in original position. See paragraph 4-7.

(7) Replace the insulation tape (black cork tape) that was removed prior to debrazing. Use insulation tape, item 14, Appendix E.

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage on the coil.

(8) Carefully place the evaporator coil, tubing, and fittings into the housing.

(9) Reaching in access area, and using care, push half couplings through holes in access.

(10) Line up coil assembly and housing screw holes.

(11) Using screwdriver, fasten coil to housing with six screws and washers.

(12) Using screwdriver, fasten three cushioned loop clamps to housing with three screws.

(13) Using wrench, install jam nuts on half couplings in access.

(14) Using wrench, carefully reconnect the low and high condenser to evaporator refrigerant metal hose line connectors to the coupling halves.

(15) Replace the dehydrator. (See paragraph 4-73.)

(16) Leak test the coil, the dehydrator, the newly brazed joints and the joints in the area of the newly brazed joints per paragraph 4-8.

(17) Evacuate and charge the refrigeration system in accordance with paragraphs 4-9 and 4-10.

Follow-on Procedures:

1. Install the heater assembly. (See paragraph 4-32.)
2. Install the front evaporator cover and radio frequency filter. (See paragraphs 3-17 and 4-17.)
3. Install the access cover. (See paragraph 3-14.)
4. Install the return air screen and frame. (See paragraph 3-18.)
5. Install air conditioner on shelter. (See paragraph 3-6.)

4-35. COUPLING HALF, MALE (EVAPORATOR REFRIGERANT PIPING DISCONNECT)

Preliminary Procedures:

1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove access cover. (See paragraph 3-14.)
3. Remove front evaporator cover and radio frequency filter. (See paragraphs 3-17 and 4-17.)

Supplies: Refrigerant Oil

a. General. The coupling half fittings (hose disconnect fittings) used for joining the interconnecting refrigerant metal hoses, contain a poppet valve assembly to prevent refrigerant loss and to keep air from entering the line when hoses are disconnected. The following instructions apply to both the suction (low pressure) and discharge (high pressure) couplings.

b. Inspect, Check couplings for cracks, breaks, loose connections, and evidence of leakage. Repair or replace defective parts.

c. Test. Leak test in accordance with paragraph 4-8.

d. Repair or replacement. All repairs other than tightening of screw joints will require disassembly and replacement of some parts. When the half couplings are disassembled for any reason, the O-rings and gaskets should be replaced.

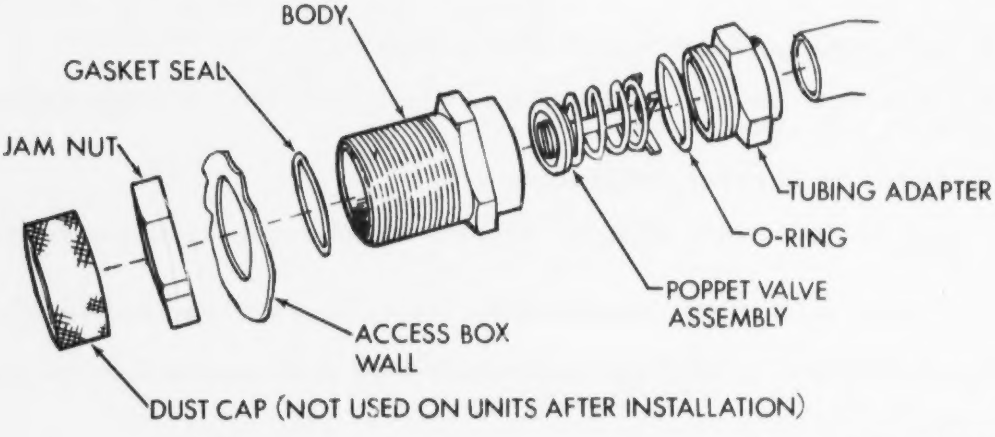


Figure 4-33. Male Coupling Half

(1) Discharge the refrigerant system. (See paragraph 4-5.)

(2) Using wrench, carefully disconnect the low and high condenser to evaporator refrigerant metal hose line connectors from the coupling halves. (See figure 4-8.)

(3) Using wrench, remove the jam nut from the inside of the access area.

(4) Carefully spring the tubing up enough to gain access to the hexes on the body and tubing adapter.

(5) Use two wrenches. Using one wrench to hold the tubing adapter, carefully remove the valve body. Carefully spring tubing up enough to remove the half coupling body, the poppet valve assembly, the O-rings, and the gasket seal.

(6) Inspect the tubing adapter for cracks and damaged threads. If defective, note position of tubing adapter hex. Debraze the tubing adapter in accordance with instructions in paragraph 4-7.

e. Installation

(1) If the tubing adapter was removed, braze a new one in place in original position in accordance with instructions in paragraph 4-7.

(2) Oil O-rings liberally with refrigerant oil, item 13, Appendix E. This will prevent it from scuffing and tearing when coupling body is threaded into adapter.

(3) Place O-rings on tubing adapter.

(4) Insert poppet valve assembly into body.

(5) Carefully engage the threads of the body and tubing adapter.

(6) Use two wrenches. Use one wrench to hold the tubing adapter and the other to tighten the half coupling body to:

suction line (larger) 35-45 foot pounds (48-61 newton meters)

discharge line (smaller) 15-20 foot pounds (20-27 newton meters)

(7) Slip the gasket seal over the threaded body end and place body threaded end down through the access box.

(8) Using wrench tighten jam nut from inside of access box.

(9) Using wrench, carefully reconnect the low and high condenser to evaporator refrigerant metal hose line connectors to the coupling halves.

(10) Replace the dehydrator. (See paragraph 4-73.)

(11) Leak test the coupling halves, the dehydrator and joints in the repair area in accordance with paragraph 4-8.

(12) Evacuate and charge the refrigerant system in accordance with paragraphs 4-9 and 4-10.

Follow-on Procedures:

1. Install front evaporator cover and radio frequency filter. (See paragraphs 3-17 and 4-17.)
2. Install access cover. (See paragraph 3-14.)
3. Install air conditioner on shelter. (See paragraph 3-6.)

4-36. EXPANSION VALVE INSPECTION, TEST AND ADJUSTMENT

Preliminary Procedure: Remove air conditioner from shelter. (See paragraph 3-6.)

Supplies: Insulating tape

a. Access

(1) Using screwdriver, remove eight screws from the outside edges of the front evaporator cover.

(2) Carefully slip front cover, with radio frequency filter and harnesses attached, out and to the side far enough to gain access to the expansion valve.

b. Inspection

(1) Inspect for evidence of leaks, kinked or otherwise damaged capillary line, and loose or missing valve stem cap.

(2) Check thermal bulb to see that it is securely clamped to the suction line.

(3) If a leak is suspected or indicated, test per paragraph 4-8.

c. Test

(1) Unwrap the insulation from the evaporator coil suction line so that thermal sensing bulb is exposed.

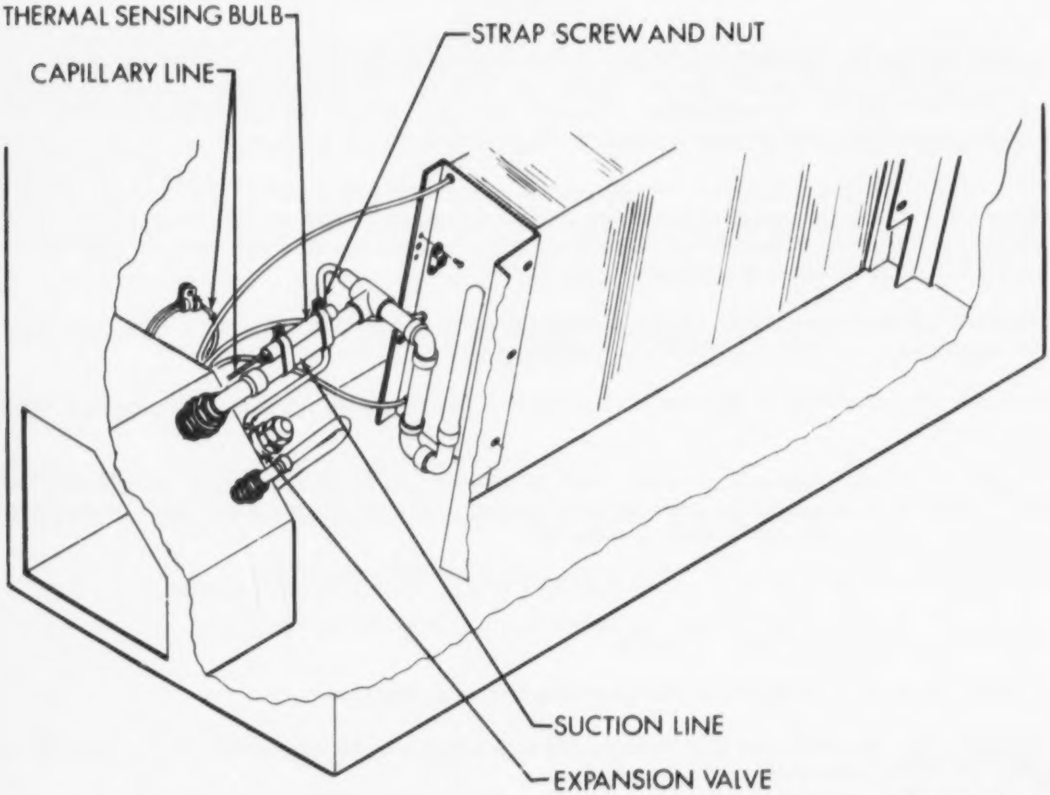


Figure 4-34. Expansion Valve Inspection, Test and Adjustment

(2) Loosen the screws and nuts in the bulb straps that attach the sensing bulb to the suction line, and pull the bulb out of the straps. Take care to note the position (center top of suction line) of the bulb.

CAUTION

Use care to not damage or kink the capillary.

(3) Connect a remote control module and a power cable to the air conditioner.

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

(4) Turn on power to air conditioner.

(5) Place the sensing bulb in a container of ice water or crushed ice so that it is reduced to a temperature near 32°F (0°C).

(6) Set the temperature thermostat control knob fully counterclockwise to COOLER position, place one hand on the exposed suction line, and start the air conditioner in COOL mode. If a drop in temperature is felt on the suction return line, the expansion valve is not closing fully and should be adjusted or replaced.

CAUTION

When performing the next test, turn the air conditioner to OFF as soon as a definite drop in temperature is felt on the suction return line. If the test conditions are continued more than a few seconds, the expansion valve will fully open and an excessive flood-back of liquid refrigerant may damage or destroy the compressor.

(7) With one hand still on the suction return line, remove the sensing bulb from the container and warm it in the other palm. If a temperature drop is not felt in the suction return line by the time the sensing bulb no longer feels cold to the hand, the expansion valve is not opening and should be adjusted or replaced. As soon as a temperature drop is felt, turn the air conditioner to OFF.

d. Adjustment. The expansion valve, as supplied with the unit, is preset at the factory. This valve should not be adjusted unnecessarily. When adjustment is necessary, see the following instructions:

(1) Remove insulation from a spot on the suction line near the sensing bulb of the thermal expansion valve to be adjusted.

(2) Install an accurate thermometer or the probe of a thermocouple on a bare spot, using a small amount of the thermal mastic, if available, to improve conductivity. Tape the thermometer bulb or thermocouple junction in position, and cover with insulating material.

(3) Connect LOW SIDE hose of charging manifold to unit LOW SIDE service valve.

(4) Check that manifold valves are closed.

(5) Loosen the hose connections at the charging manifold *slightly*.

(6) *Slightly* open the unit LOW SIDE service valve to allow a *small* amount of refrigerant to purge the hose. Tighten the hose connection at the manifold.

(7) Fully open the LOW SIDE service valve.

(8) Hold the front cover with radio frequency filter, harnesses, and cables in place in mounted position on the unit to minimize air leaks.

(9) Operate the air conditioner in the cooling mode for about 30 minutes, briefly removing front panel and observing the thermometer or thermocouple dial to see that the temperature has stabilized. When the temperature remains unchanged for at least two minutes, record the temperature and pressure.

(10) Compare the recorded temperature and pressure with those in table 4-3. The temperature measured should register approximately 12°F (6.7°C) higher than the temperature listed on the table.

(11) If adjustment is necessary, remove the cap from the expansion valve (fig. 4-35) and turn the adjusting stem counterclockwise to decrease the superheat and clockwise to increase the superheat. When adjusting the valve, make no more than one turn of the stem at a time and observe the change in the superheat closely to prevent overshooting the desired setting. Allow unit to stabilize before taking reading.

(12) When the proper setting is obtained, turn off air conditioner and replace the cap on the valve adjusting stem.

(13) Remove the thermometer or thermocouple probe from the suction line, and replace the insulating material. Close the LOW SIDE service valve, remove the charging manifold and hose, and install the cap on the service valve gage port.

e. Reassemble

(1) Turn power off.

(2) Disconnect remote control module assembly and power cable.

(3) Slip the sensing bulb into its mounting bulb straps. Be sure the bulb is on the top of the suction line in original position and tighten the two nuts and screws. Be sure the sensing bulb is making good metal-to-metal contact with the suction line.

(4) Cover the bulb and suction line with two layers of insulation tape, item 14, Appendix E. Apply in spiral with overlapping edges.

(5) Carefully slip front evaporator cover with radio frequency filter and harnesses attached back in place.

(6) Aline holes and using screwdriver, secure the cover with eight screws.

Follow-on Procedure: Install air conditioner on shelter. (See paragraph 3-6.)

4-37. EXPANSION VALVE REPLACEMENT

For inspection, test, and adjustment, see paragraph 4-36.

Preliminary Procedures:
1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Discharge refrigerant. (See paragraph 4-5.)
3. Remove evaporator coil and piping. (See paragraph 4-34.)

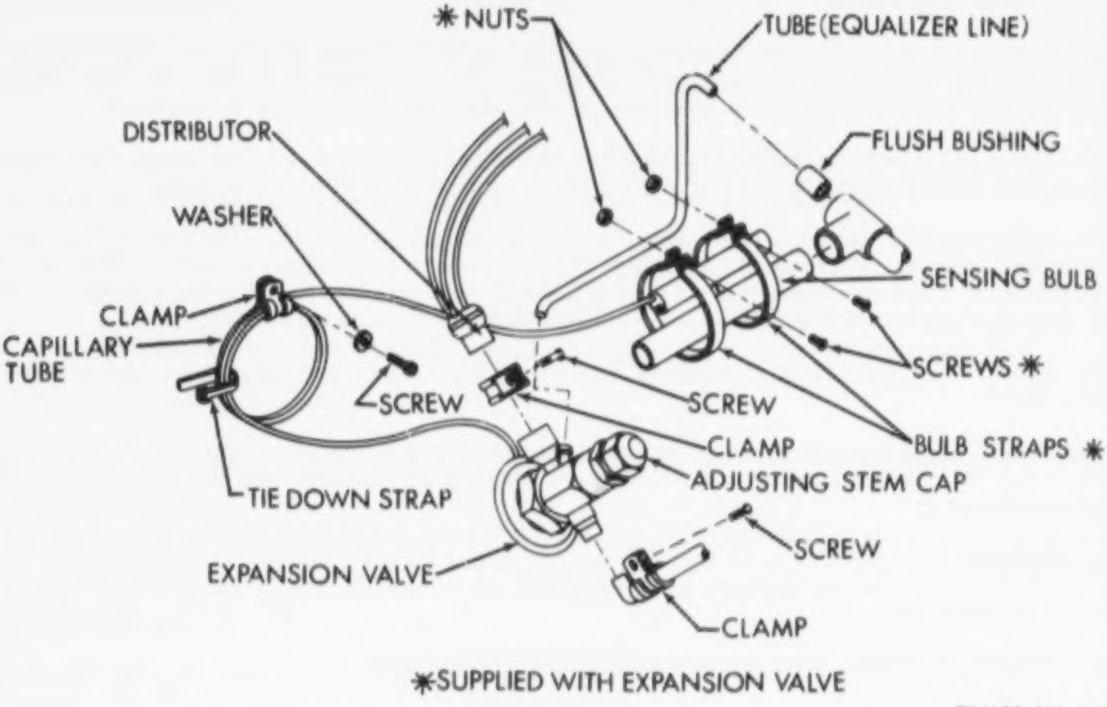


Figure 4-35. Expansion Valve

WARNING

REFRIGERANT UNDER PRESSURE
is used in the operation of this equipment
DEATH
or severe injury may result if you fail to observe safety precautions.

Never use a heating torch on any part that contains Refrigerant 22.

Do not let liquid refrigerant touch you, and do not inhale refrigerant gas.

b. Disassembly/Removal

(1) Be sure refrigerant has been discharged. (See paragraph 4-5.)

(2) Tubing should be nitrogen purged during all brazing/debrazing operations. (See paragraph 4-6.)

(3) Unwrap insulation tape (black cork tape) from joints that are to be debrazed and from the sensing bulb.

(4) Loosen the screws and nuts in the bulb straps that attach the sensing bulb to the suction line, and pull the bulb out of the straps. Take care to note the position (center top of suction line) of the bulb.

CAUTION

Use care to not damage or kink the capillary.

(5) Note exact position of expansion valve on refrigerant line.

(6) Wrap wet rags around expansion valve body and distributor tubes.

(7) Using torch debraze and separate the distributor, elbow and equalizer line tubing from the expansion valve. See paragraph 4-7.

(8) Remove expansion valve.

d. Reassembly/Installation

(1) Tubing should be nitrogen purged during all brazing/debrazing operations.

(2) Clean and prepare distributor, tubing and elbow prior to installing new expansion valve. (See paragraph 4-7.)

(3) Slip expansion valve in place in original position and check that fittings and tubing fit properly into expansion valve solder cups.

(4) Wrap wet rags around expansion valve body and distributor tubes.

(5) Using torch braze the three expansion valve joints in accordance with paragraph 4-7.

(6) Slip the sensing bulb into its mounting bulb straps. Be sure the bulb is on the top of the suction line in original position and tighten the two nuts and screws. Be sure the sensing bulb is making good metal-to-metal contact with the suction line.

(7) Replace the insulation tape that was removed from the sensing bulb and expansion valve connections. Use insulation tape, item 14, Appendix E. Apply in spiral with overlapping edges.

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage on the coil.

(8) Carefully place the evaporator coil, tubing, and fittings into the housing.

(9) Reaching in access area, and using care, push half couplings through holes in access.

(10) Line up coil assembly and housing screw holes.

(11) Using screwdriver, fasten coil to housing with six screws and washers.

(12) Using screwdriver, fasten three cushioned loop clamps to housing with three screws.

(13) Using wrench, install jam nuts on half couplings in access.

(14) Using wrench, carefully reconnect the low and high condenser to evaporator refrigerant metal hose line connectors to the coupling halves.

(15) Replace the dehydrator. (See paragraph 4-73.)

(16) Leak test the coil, the dehydrator, the newly brazed joints, and the joints in the area of the newly brazed joints per paragraph 4-8.

(17) Evacuate and charge the refrigeration system in accordance with paragraphs 4-9 and 4-10.

Follow-on Procedures:

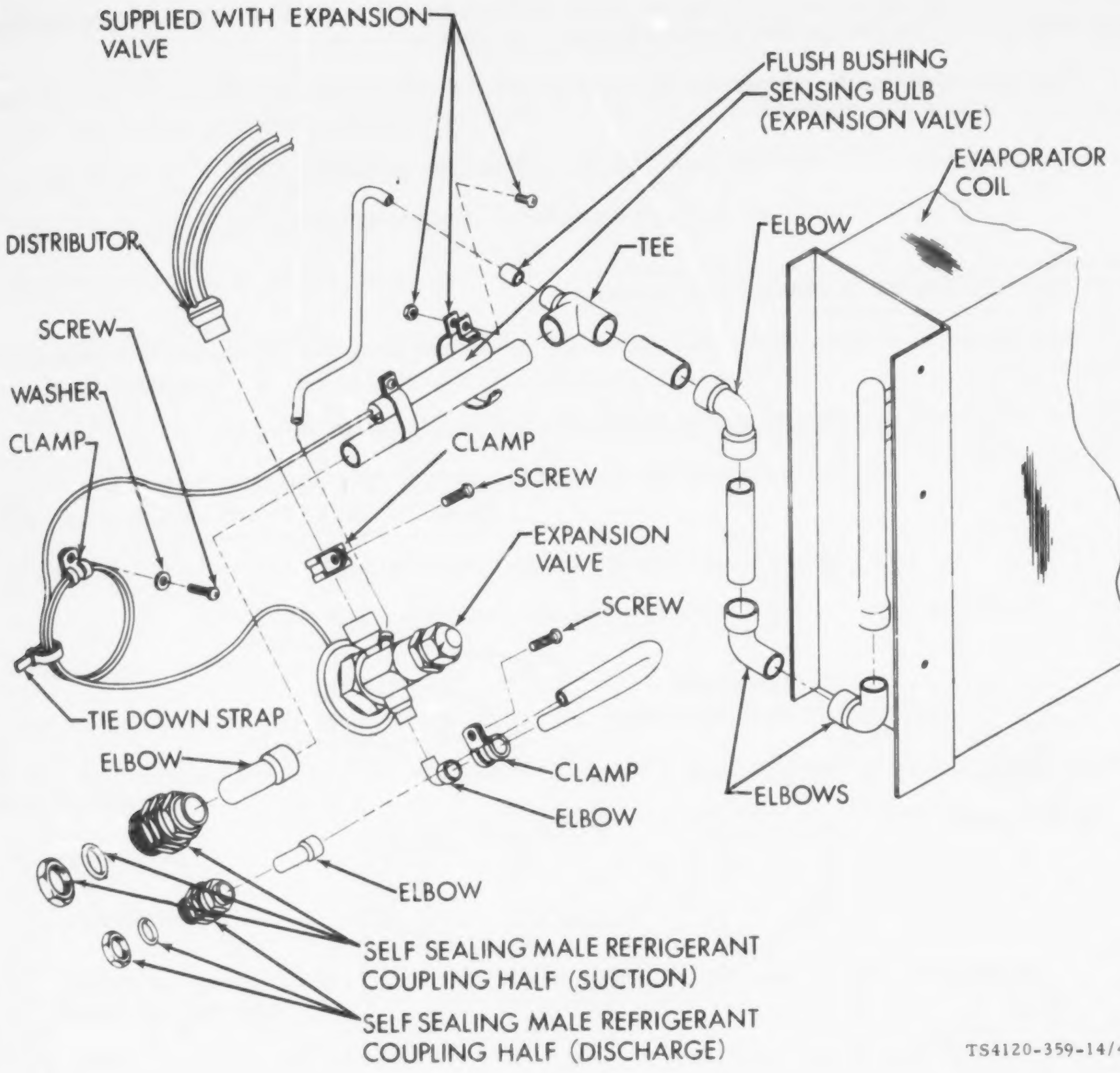
1. Install the heater assembly. (See paragraph 4-32.)
2. Install the front evaporator cover and radio frequency filter. (See paragraphs 3-17 and 4-17.)
3. Install the access cover. (See paragraph 3-14.)
4. Install the return air screen and frame. (See paragraph 3-18.)
5. Install air conditioner on shelter. (See paragraph 3-6.)

4-38. TUBING AND FITTINGS (EVAPORATOR ASSEMBLY)

The evaporator assembly contains a number of pieces of copper tubing in a variety of material grades, sizes, lengths, and shapes and a number of elbows, tees, and adapters. Observe the following when replacing any piece of tubing or fitting in the system:

Preliminary Procedures:

1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove evaporator coil and piping. (See paragraph 4-34.)


SUPPLIED WITH EXPANSION VALVE
FLUSH BUSHING
SENSING BULB (EXPANSION VALVE)
EVAPORATOR COIL
DISTRIBUTOR
ELBOW
TEE
SCREW
WASHER
CLAMP
CLAMP
SCREW
EXPANSION VALVE
SCREW
TIE DOWN STRAP
ELBOW
CLAMP
ELBOW
ELBOWS
ELBOW
SELF SEALING MALE REFRIGERANT COUPLING HALF (SUCTION)
SELF SEALING MALE REFRIGERANT COUPLING HALF (DISCHARGE)

TS4120-359-14/4-36

Figure 4-36. Refrigeration Piping, Evaporator Section

WARNING

Be sure the refrigeration system is fully discharged and purged, and that dry nitrogen is flowing through the system at a rate of less than 1-2 cfm (0.028 - 0.057 m^3/minute) before brazing or debrazing.

a. Replace tubing and fittings only with equal material, grade, size, length, and shape as the item removed.

b. Leak test the entire refrigeration system in accordance with paragraph 4-8 after any replacement action that required brazing.

c. Replace the dehydrator and leak test the dehydrator flare fittings as the final step in any maintenance action that required the refrigeration pressure system to be opened.

d. Evacuate and charge the refrigeration system in accordance with paragraphs 4-9 and 4-10 after all other maintenance actions are completed.

Follow-on Procedures: 1. Install evaporator coil and piping. (See paragraph 4-34.)

2. Install air conditioner on shelter. (See paragraph 3-6.)

4-39. PLASTIC TUBING (CONDENSATE DRAIN)

There are three pieces of plastic tubing used to drain the condensate water that is collected in the evaporator drain pan.

Preliminary Procedure: 1. Remove air conditioner from shelter. (See paragraph 3-6.)

2. Remove covers and parts as necessary to have access to the tube(s).

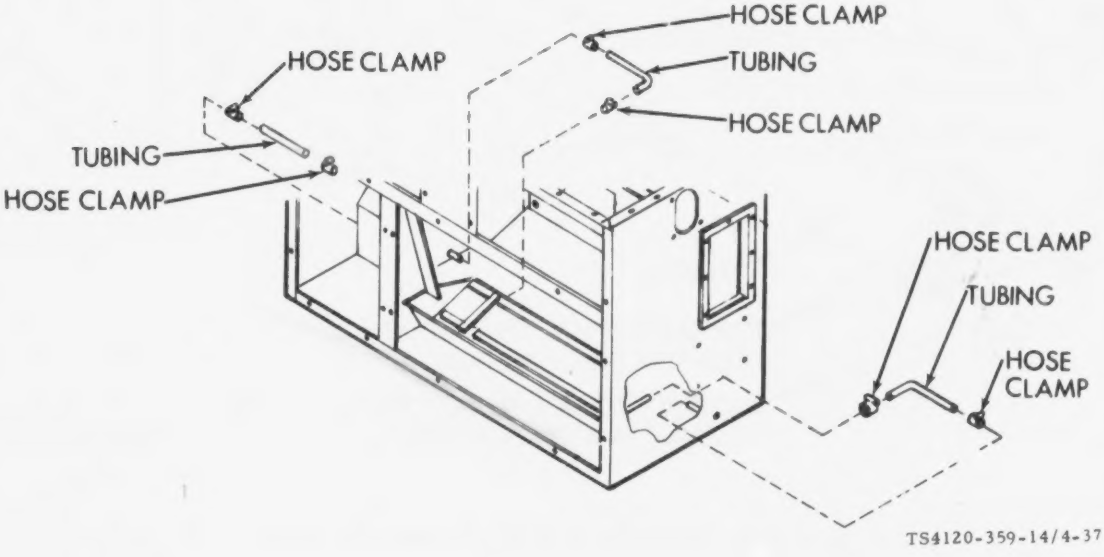


Figure 4-37. Condensate Drain Tubing

a. Inspection

(1) Check tubing for cuts, splits, and deteriorated condition. Replace damaged tubing.

(2) Check that clamps are not loose or missing.

(3) Check that tubing and connection points are not clogged.

b. Removal

(1) Remove clamps.

(2) Pull tubing loose from connection points.

c. Installation

(1) Slip clamps over tubing.

(2) Slip tubing on to connection points.

(3) Secure clamps in place.

Follow-on Procedures: 1. Install parts and covers that were removed.

2. Install air conditioner on shelter. (See paragraph 3-6.)

4-40. INSULATION, EVAPORATOR HOUSING

Preliminary Procedures: 1. Remove air conditioner from shelter. (See paragraph 3-6.)

2. Remove covers and parts as necessary to have access to repair area.

a. Inspection

(1) Check that reflective panels and insulation are securely attached. Repair if loose.

(2) Check that reflective panels and insulation are not damaged or missing. Replace if missing, burnt away, or damaged.

b. Removal

NOTE

Prior to removal of old insulation, cut the new replacement material to size using the old item as a sample.

(1) Remove as much old insulation material as possible by pulling or scraping it away from the metal surface.

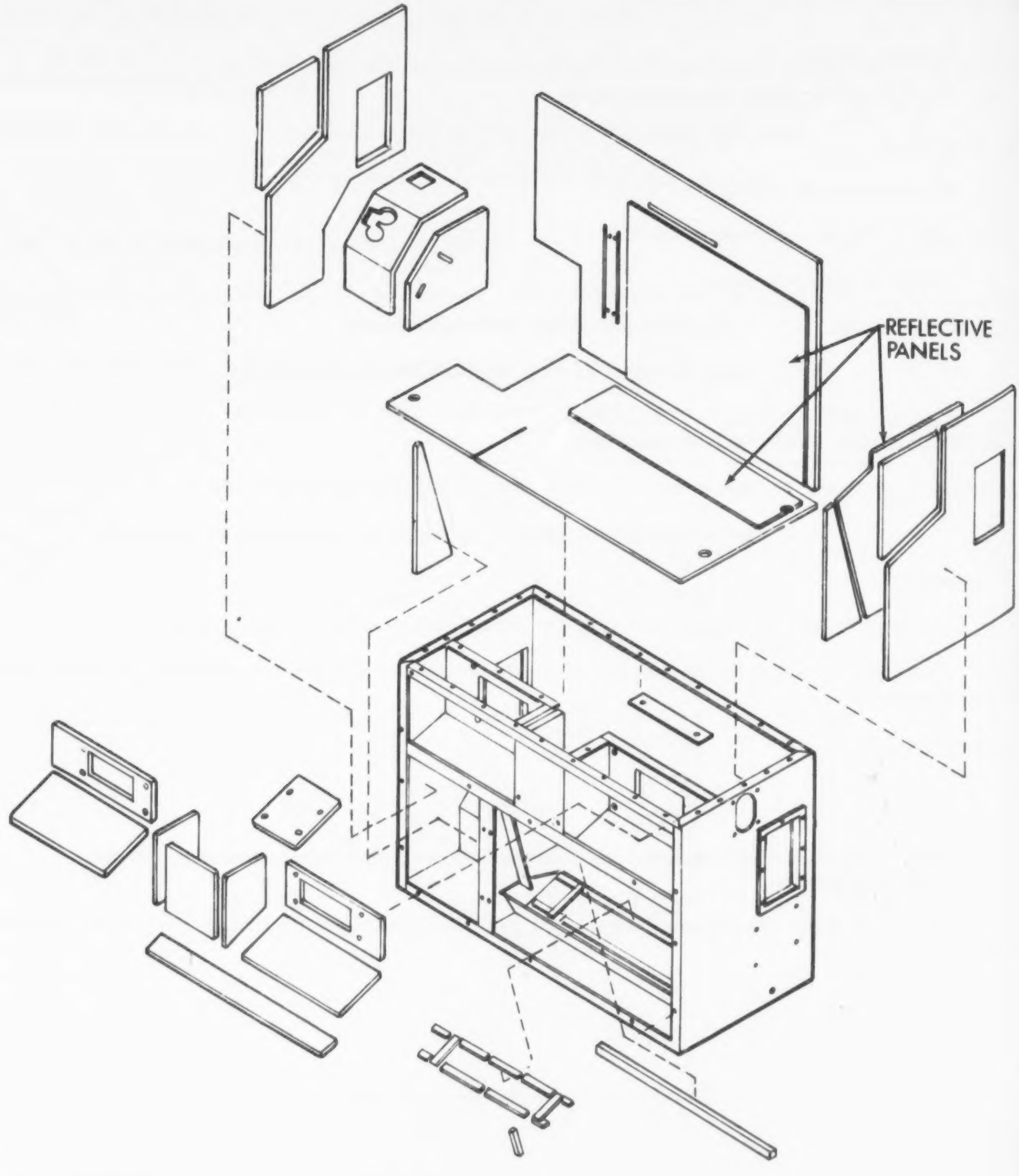


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Figure 4-38. Insulation, Evaporator Housing

WARNING

Acetone and methly-ethyl-ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

(2) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

c. Installation

(1) Cut to size.

(2) Be sure that the surface to which the insulation is to be applied is clean and free of paint and old adhesive material.

(3) Coat the mating surfaces of the metal and the insulation with adhesive (item 12, Appendix E). Let both surfaces air dry until the adhesive is tacky, but will not stick to the fingers.

(4) Starting with an end, carefully attach the insulation to the metal. Press into firm contact all over.

Follow-on Procedures:
1. Install all parts and covers that were removed.
2. Install air conditioner on shelter. (See paragraph 3-6.)

4-41. ELECTRICAL MODULE ASSEMBLY, EVAPORATOR SECTION (REMOVAL/INSTALLATION)

Preliminary Procedure:
1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove top evaporator cover. (See paragraph 3-21.)

a. Removal

(1) Disconnect P2A, P3, P4, and P6 connector plugs.

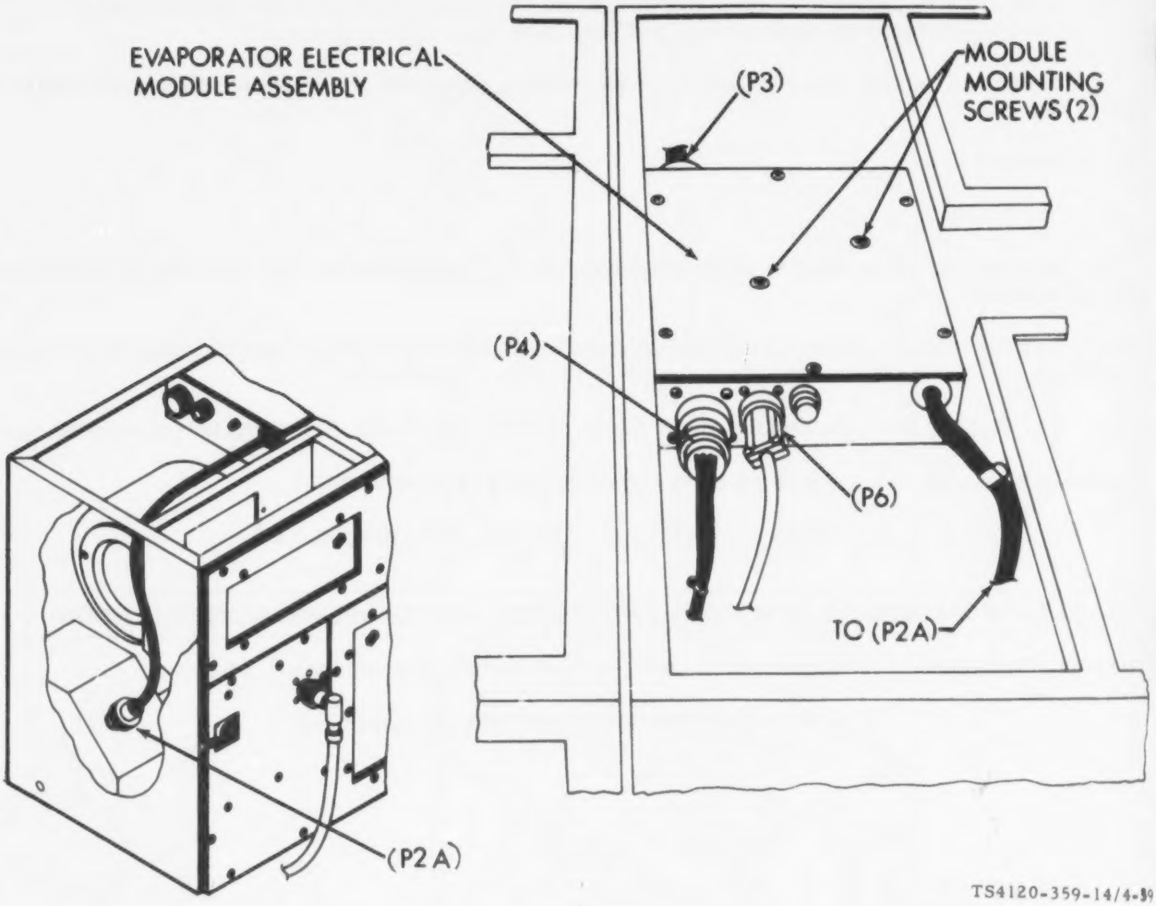
EVAPORATOR ELECTRICAL MODULE ASSEMBLY
(P3)
MODULE MOUNTING SCREWS (2)
(P4)
(P6)
TO (P2A)
(P2 A)
TS4120-359-14/4-39

Figure 4-39. Evaporator Electrical Module Assembly Removal/Installation

(2) Using screwdriver, loosen the two evaporator section electrical module mounting screws.

(3) Lift the electrical module up and out of the air conditioner.

b. Installation

(1) Place the electrical module in position and aline the module mounting screws.

(2) Using screwdriver, secure the module mounting screws.

(3) Connect the P2A, P3, P4, and P6 connector plugs.

Follow-on Procedures: 1. Install top evaporator cover. (See paragraph 3-21.)

2. Install air conditioner on shelter. (See paragraph 3-6.)

4-42. TOP COVER AND GROMMETS, EVAPORATOR ELECTRICAL MODULE

Preliminary Procedure: Remove evaporator section electrical module assembly. (See paragraph 4-41.)

a. Removal

(1) Using screwdriver, remove six screws and lock washers.

(2) Lift top cover off.

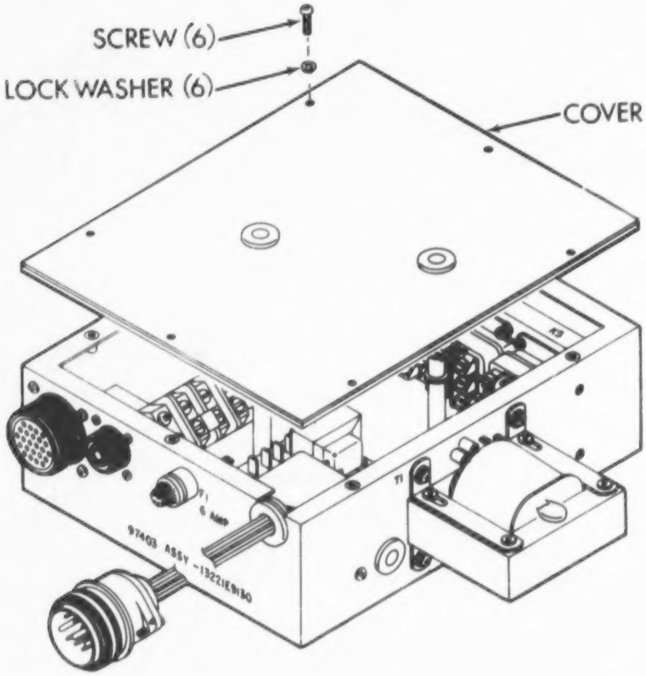

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Figure 4-40. Top Cover and Grommets, Evaporator Electrical Module

b. Inspection

(1) Check that cover is not bent or punctured. Replace if damaged.

(2) Check that EMI gaskets are not cracked, loose, or missing. Repair or replace as needed.

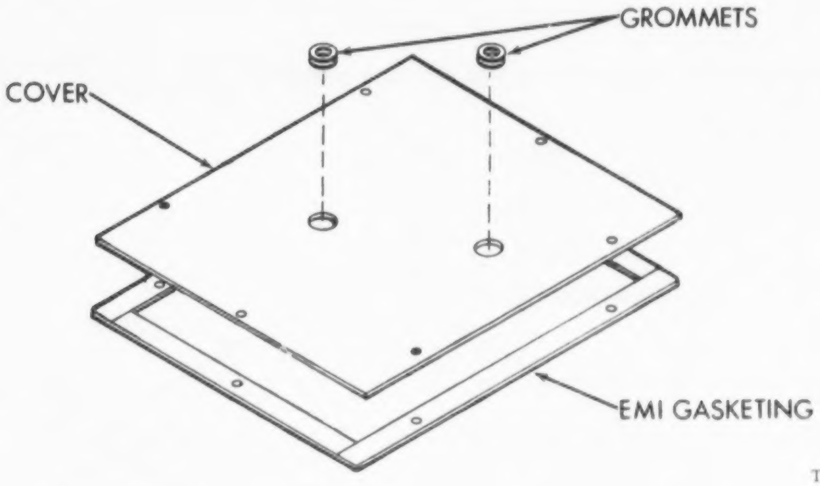
c. Repair

(1) Remove and replace grommets if they are damaged.

NOTE

Prior to removal of the old gasket material, cut the new replacement material to size using the old material as a sample.

(2) Remove as much of the old gasket material as possible by pulling or scraping it away from the metal surface.



TS4120-359-14/4-41

Figure 4-41. Cover, Evaporator Electrical Module

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

(3) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

(4) Use only approved replacement material as specified in TM 5-4120-359-24P.

(5) EMI gasket material specified for this unit is supplied with adhesive backing.

(6) Cut gasket to size. Be sure that EMI gasket corners are installed so that good continuous edge contact is made.

(7) Be sure that surface to which gasket is to be applied is clean and free of paint and old adhesive material.

(8) Remove backing material from adhesive side and immediately press gasket in place. *Be sure* that good edge to edge contact is made on the EMI gaskets.

d. Installation

(1) Place cover on box and line up holes.

(2) Using screwdriver, attach the cover with six screws and lock washers. Do not overtighten, it will cause distortion.

Follow-on Procedure: Install evaporator section electrical module assembly. (See paragraph 4-41.)

4-43. WIRING HARNESSES, RECEPTACLE GASKETS, LEADS AND DISCONNECT SPLICES — EVAPORATOR ELECTRICAL MODULE

Preliminary Procedures: Remove evaporator section electrical module assembly. (See paragraph 4-41.)

a. Access

(1) Using screwdriver, remove six screws and lock washers.

(2) Lift top cover off.

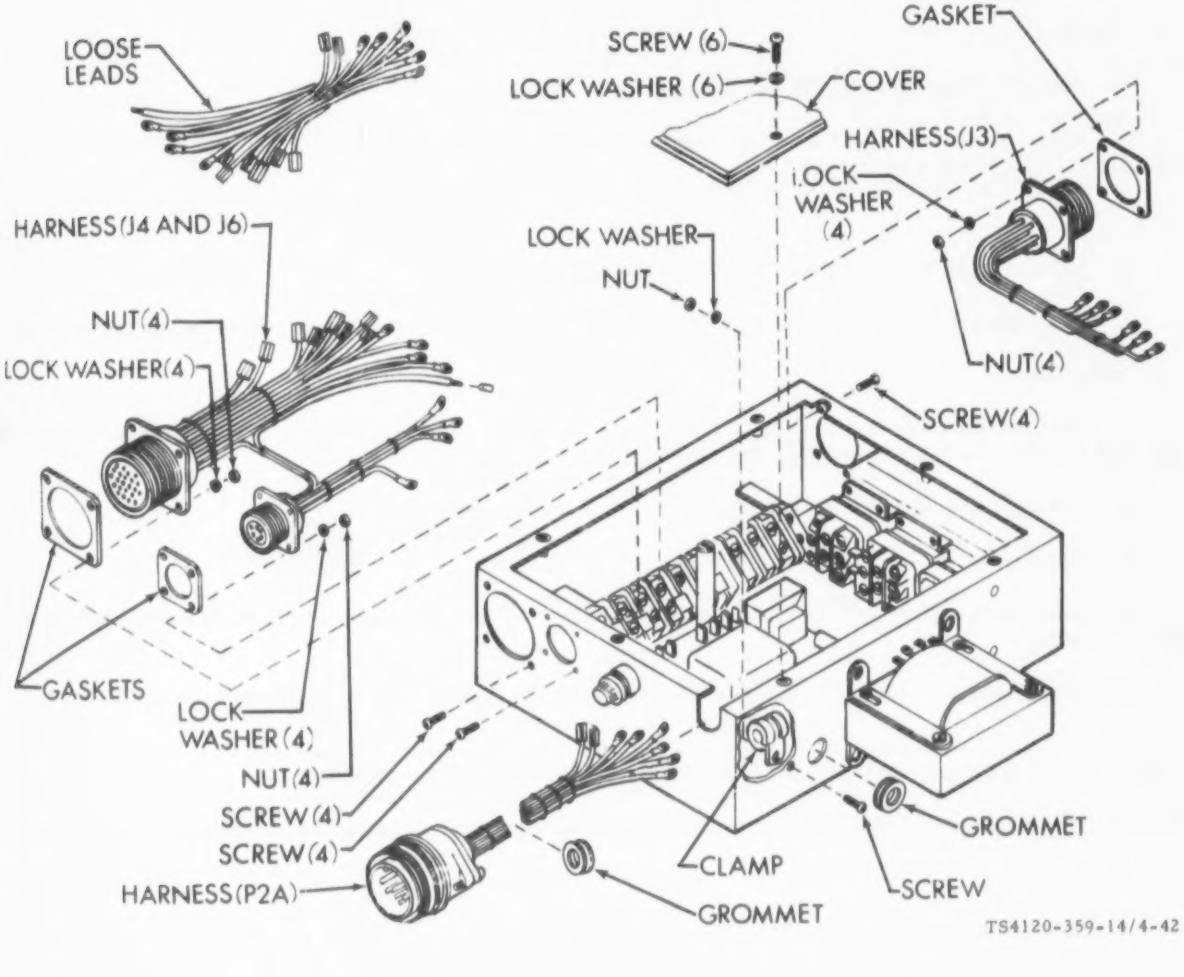


Figure 4-42. Harnesses and Leads

b. Inspect/Test

(1) Check connectors for general condition, loose, broken, or missing contacts. Replace connectors if damaged.

(2) Check individual wires for loose solder and terminal lug connections, cut or frayed insulation, and cut or broken wires.

(3) See wiring diagram figure 4-3 and continuity test individual wires. Repair wires with no continuity.

(4) Check that gaskets are in good condition. Replace them if they are torn, missing, or otherwise damaged.

(5) Check that disconnect splice connections are tight and in good condition. Replace if damaged or loose.

(6) Check that protective plastic tubing over disconnect splice connections are in place and in good condition. Replace if missing, damaged, or loose.

c. Removal

(1) Tag and disconnect leads.

(2) Using screwdriver and wrench, remove screws, lock washers and nuts and remove the affected connectors, harnesses, and gaskets.

d. Repair

(1) See paragraph 4-3 for general wire repair instructions.

(2) See table 4-2 Wire List for wire lengths and terminal information when individual wires are replaced.

e. Installation

(1) Using screwdriver and wrench, install the connector(s) in box with screws, lock washers and nuts. Be sure that gaskets are placed between connectors and box.

(2) See tags and wiring diagram figure 4-3 and reconnect leads. Remove tags.

(3) Place cover on box and line up holes.

(4) Using screwdriver, attach the cover with six screws and lock washers. Do not overtighten, it will cause distortion.

Follow-on Procedure: Install evaporator section electrical module assembly. (See paragraph 4-41.)

4-44. MODULE MOUNTING SCREWS, EVAPORATOR ELECTRICAL MODULE

Preliminary Procedures: Remove evaporator section electrical module assembly. (See paragraph 4-41.)

a. Access

(1) Using screwdriver, remove six screws and lock washers.

(2) Lift top cover off.

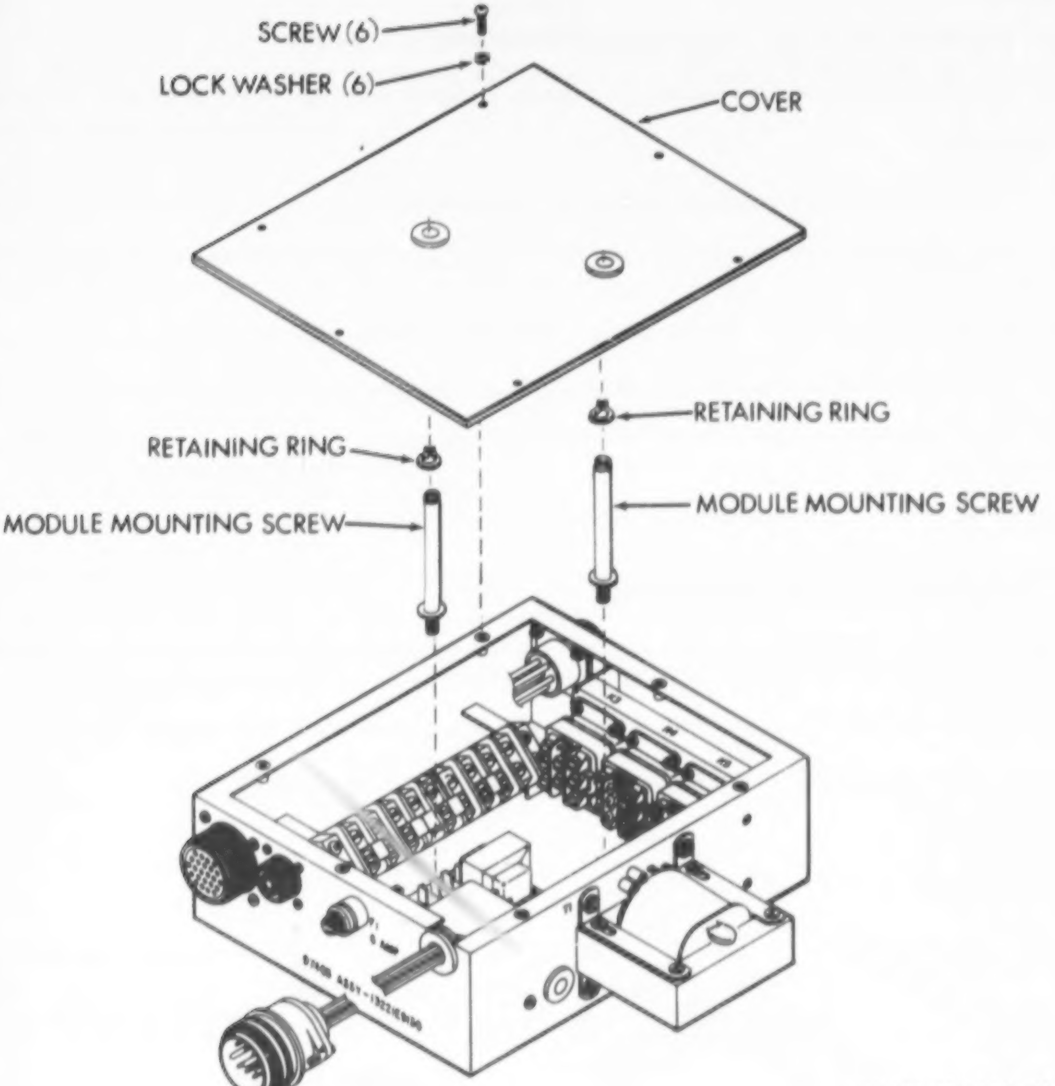


Figure 4-43. Module Mounting Screw

b. Inspection

(1) Check that retaining ring is in place and in good condition. With the cover in place, the ring washer should be positioned on the screw shaft so that screw does not bounce up and out of the bottom hole. Replace if missing, loose, or broken.

(2) Check screw threads and top slot for general condition. Replace module mounting screw if damaged.

c. Removal

(1) With the cover off, the module mounting screws may be lifted out.

(2) To remove or adjust the retaining ring, spring it slightly and slip to desired location or remove it.

d. Installation

(1) Place the retaining ring on the module mounting screw.

(2) Adjust it so that, with the cover in place, the screw portion will not come up and out of the bottom hole in the box.

(3) Place the assembled module mounting screws and washers in the box.

(4) Place cover on box and line up holes.

(5) Using screwdriver, attach the cover with six screws and lock washers. Do not overtighten, it will cause distortion.

Follow-on Procedure: Install evaporator section electrical module assembly. (See paragraph 4-41.)

4-45. VARISTOR (RV4) AND TRANSFORMER (T1) TEST

Conditions of test:

1. Evaporator section electrical module assembly must be connected to an operable air conditioner and remote control assembly.
2. 208 V, 3 phase, 400 Hz power, and power cable must be available.
3. Top evaporator cover must be removed. (See paragraph 3-21.)

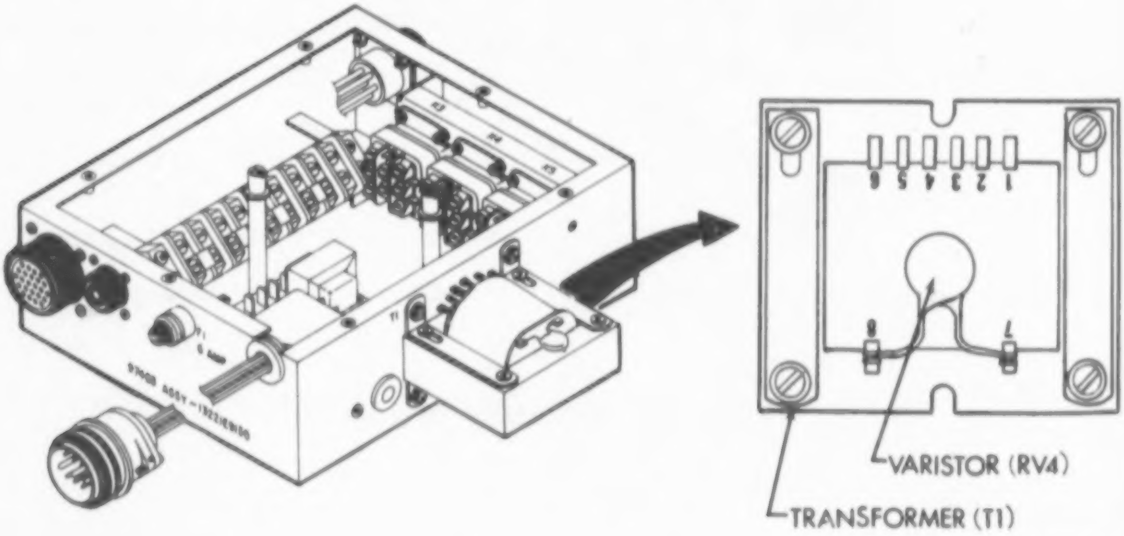


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Figure 4-44. Transformer (T1) Terminal Locations

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

a. Connect power to air conditioner.

b. Using multimeter, check voltage across terminals 2 and 5. Voltage should be 197 to 229 Vac. If voltage is low or there is no voltage, check for loose or broken connections and absence of power.

c. Using multimeter, check voltage across terminals 7 and 8. Voltage should be 27 to 33 Vac. If voltage is low or there is no voltage, transformer should be changed.

d. Remove power to air conditioner.

e. Check varistor for evidence of overheating. Replace if discolored or damaged.

4-46. VARISTOR (RV4) AND TRANSFORMER (T1)

For tests see paragraph 4-45.

Preliminary Procedures: Remove evaporator section electrical module assembly. (See paragraph 4-41.)

a. Removal

(1) Using screwdriver, remove six screws and lock washers.

(2) Lift top cover off.

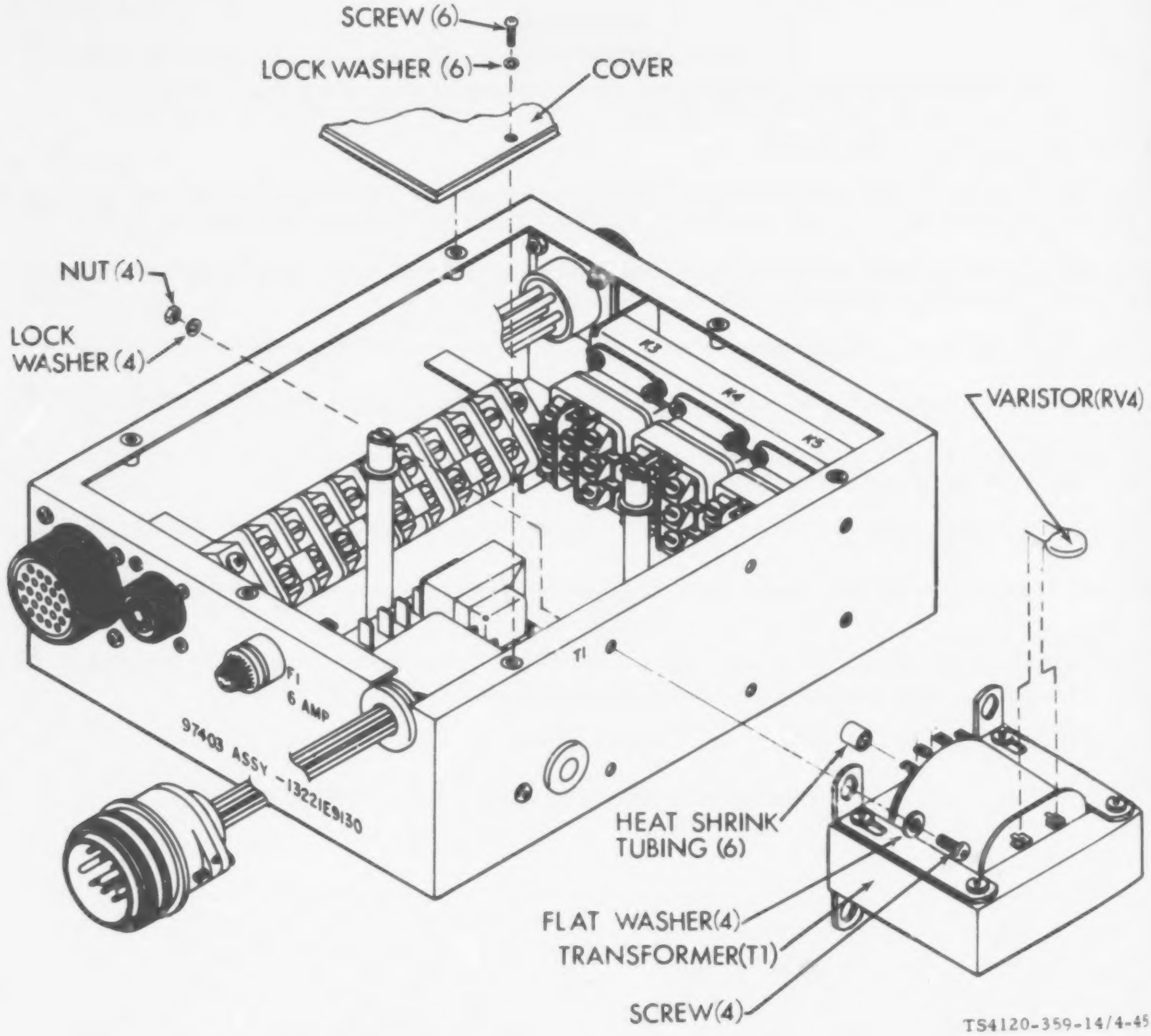

Figure 4-45. Varistor (RV4) and Transformer (T1)

(3) Using knife, cut insulation tubing from around transformer terminals.

(4) Tag leads.

(5) Using soldering gun, unsolder leads and varistor (RV4) from terminals.

(6) Using screwdriver and wrench, remove four each screws, flat washers, lock washers, and nuts tha hold transformer to housing.

(7) Lift transformer (T1) off.

b. Installation

(1) Position transformer (T1) on module housing. Using screwdriver and wrench, install four each screws, flat washers, lock washers, and nuts.

(2) Using knife, cut six pieces of heat shrinkable tubing, each one-half inch (1.27 cm) long and slide onto wires and varistor.

(3) Using soldering gun, solder leads to transformer terminals according to wire markings, tags, and wiring diagram figure 4-3. Solder varistor (RV4) to terminals 7 and 8. Remove tags.

(4) Slip piece of tubing over each transformer terminal and using heat gun, shrink tubing in place.

(5) Place cover on box and line up holes.

(6) Using screwdriver, attach the cover with six screws and lock washers. Do not overtighten, it will cause distortion.

Follow-on Procedure: Install evaporator section electrical module assembly. (See paragraph 4-41.)

4-47. TEMPERATURE CONTROL COMPONENT BOARD (A1) TEST

Conditions of test:
1. Evaporator section electrical module assembly must be connected to an operable air conditioner and remote control assembly.
2. 208V, 3 phase, 400 Hz power, and power cable must be available.
3. Top evaporator cover must be removed. (See paragraph 3-21.)
4. Top module cover must be removed. (See paragraph 4-42.)

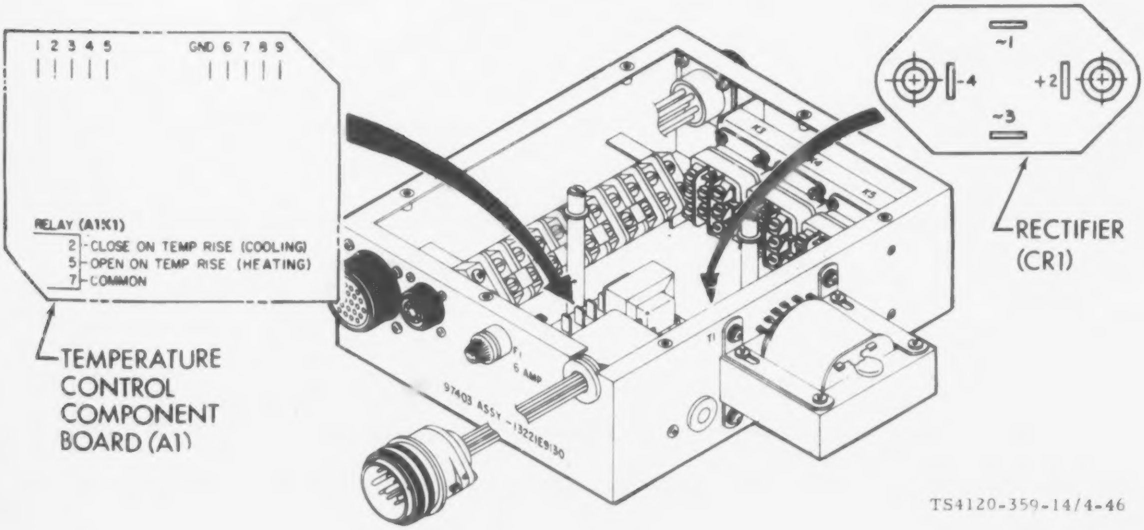
1 2 3 4 5
GND 6 7 8 9
RELAY (A1K1)
2 - CLOSE ON TEMP RISE (COOLING)
5 - OPEN ON TEMP RISE (HEATING)
7 - COMMON
TEMPERATURE CONTROL COMPONENT BOARD (A1)
~1
-4
+2
~3
RECTIFIER (CR1)
K3
K4
K5
T1
F1
6 AMP
97403 ASSY - 13221E9130

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Figure 4-46. Temperature Control Component Board (A1) Test

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

a. Connect power to air conditioner.

b. Turn selector switch to COOL.

c. Turn temperature control to maximum COOLER.

d. Using multimeter, check temperature control output voltage between terminals CR1-4 neg (-) and A1K1-2. Voltage should be 25 to 31 Vdc.

e. Turn selector switch to LOW HEAT.

f. Turn temperature control to maximum WARMER.

g. Using multimeter, check temperature control output voltage between terminals CR1-4 neg (-) and A1K1-5. Voltage should be 25 to 31 Vdc.

h. Turn selector switch to OFF.

i. Remove power to air conditioner.

4-48. TEMPERATURE CONTROL COMPONENT BOARD (A1)

For test, see paragraph 4-47.

Preliminary Procedures: Remove evaporator section electrical module assembly. (See paragraph 4-41.)

a. Access

(1) Using screwdriver, remove six screws and lock washers.

(2) Lift top cover off.

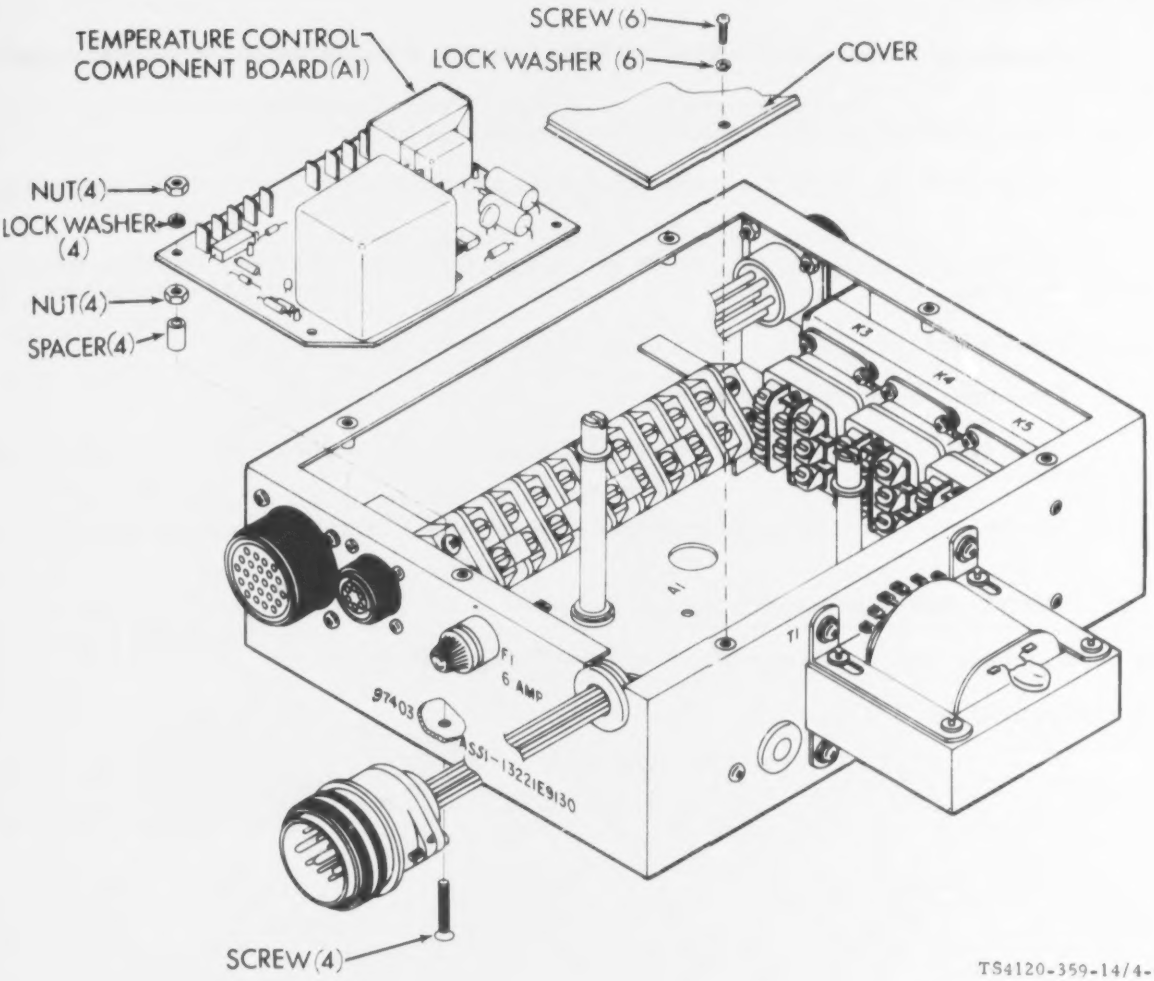

Figure 4-47. Temperature Control Component Board (A1)

b. Inspect

(1) Check for loose or broken components. Replace if loose or broken components are found.

(2) Check for loose terminal connections. Repair or replace all loose connections.

c. Removal

(1) Tag leads.

(2) Using pliers, remove nine quick-disconnect terminals and clear leads away from terminals.

(3) Using screwdriver to retain the screws, remove the top four nuts and lock washers with a socket and ratchet.

(4) Lift the temperature control component board up and out of the box.

(5) Check the remaining four nuts, spacers, and screws to be sure they are tight and in good condition. Remove and replace them if they are damaged.

d. Installation

(1) Place the temperature control component board on the four nuts, spacers, and screws that were left in the box.

(2) Use a screwdriver to retain the screws from the bottom of the box.

(3) Using socket and ratchet, secure the temperature control component board with four nuts and lock washers.

(4) Install nine quick-disconnect terminals on terminals according to tags, wire markings, and wiring diagram, figure 4-3.

(5) Remove tags.

(6) Place cover on box and line up holes.

(7) Using screwdriver, attach the cover with six screws and lock washers. Do not overtighten, it will cause distortion.

Follow-on Procedure: Install evaporator section electrical module assembly. (See paragraph 4-41.)

4-49. FUSE (F1) AND FUSEHOLDER (XF1)

Preliminary Procedure: Remove top evaporator cover. (See paragraph 3-21.)

a. Test/Inspect fuse (F1)

(1) Push in, turn, and remove the fuse holder cap.

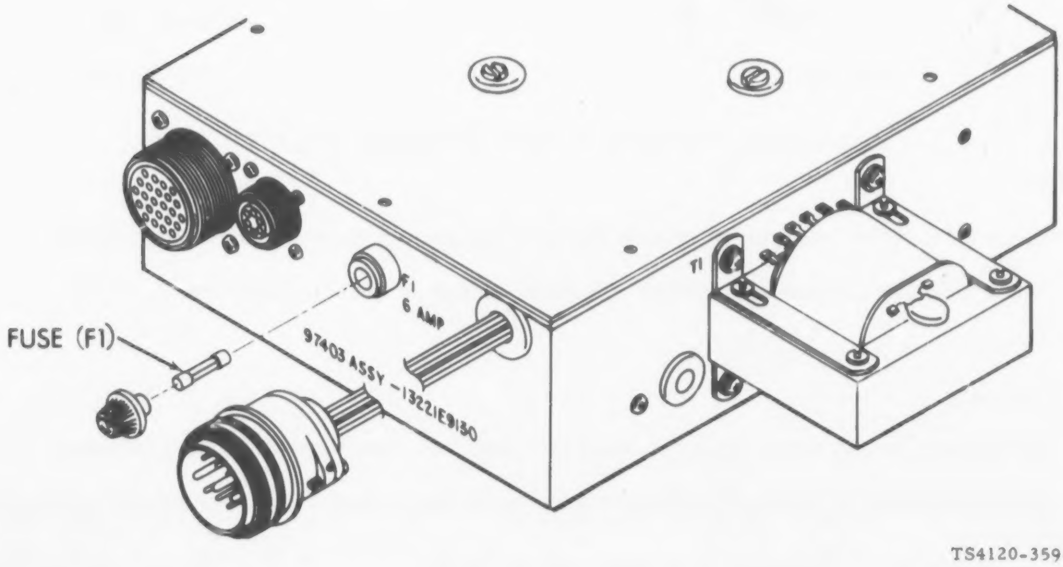

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Figure 4-48. Fuse (F1)

(2) Remove fuse.

(3) Look at fuse to see if the center element is broken or melted. Replace fuse if found bad.

(4) Using multimeter, test fuse for continuity. Replace fuse if no continuity.

NOTE

A blown fuse often indicates problems with other electrical parts.

b. Test/inspect fuse holder (XF1)

(1) Using screwdriver, remove six screws and lock washers and lift the top cover from the electrical module.

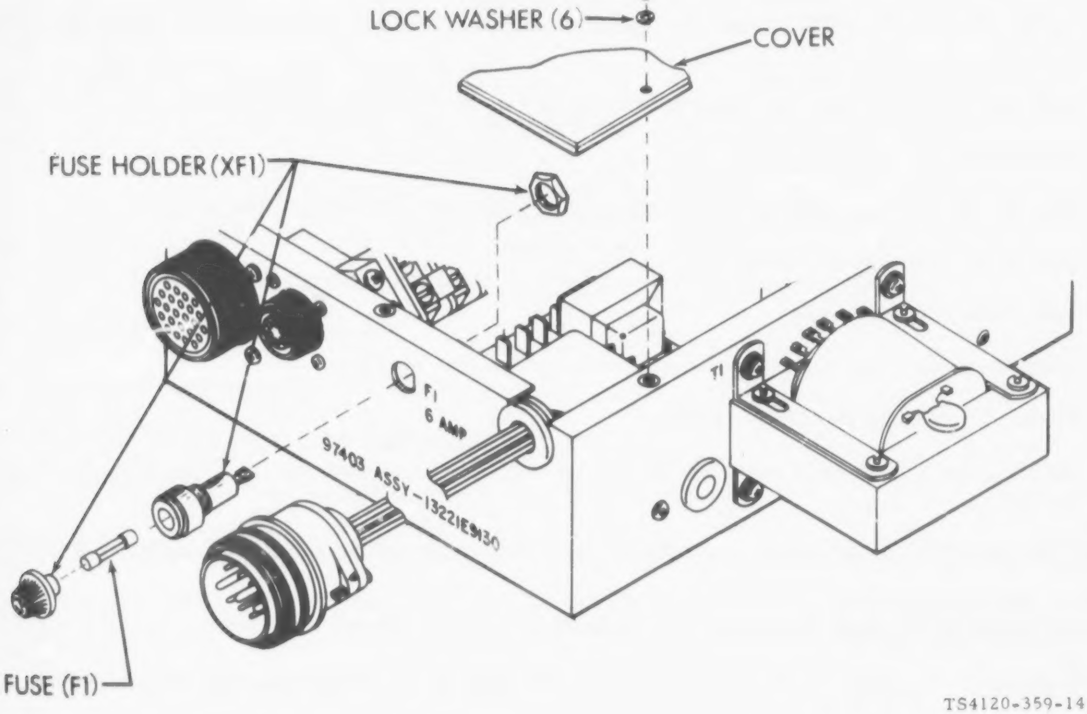

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Figure 4-49. Fuse (F1) and Fuseholder (XF1)

(2) Check that fuseholder is not cracked, broken or otherwise damaged. Replace if bad.

(3) Check that terminals and wire lead connections are tight. Repair loose connections. Replace fuseholder if terminals are broken.

(4) Be sure the fuse is in place and known good.

(5) Using multimeter, check fuseholder continuity between terminals. If no continuity, replace fuseholder.

c. Removal

(1) Push fuseholder cap in, turn and remove.

(2) Remove fuse. If fuse only is to be replaced, go to step (5) of installation.

(3) If top cover has not been removed, use screwdriver to remove six screws and lock washers. Remove top cover.

(4) Tag and unsolder leads to fuseholder.

(5) Use wrench to loosen nut on rear of fuseholder.

(6) Remove nut and fuseholder.

d. Installation

(1) Insert fuseholder body through box and use wrench to secure nut.

(2) Using knife, cut two pieces of heat shrinkable tubing, each one-half inch (1.27 cm) long and slide onto leads.

(3) See tags, wire marking or wiring diagram, figure 4-3. Solder leads to fuseholder.

(4) Remove tags.

(5) Slip tubing into place over terminal and using heat gun, shrink tubing in place.

(6) Push fuseholder cap in, turn and remove cap.

(7) Insert fuse into fuseholder.

(8) Place fuseholder cap in body and push in and turn to lock in place.

(9) Place cover on box and line up holes.

(10) Using screwdriver, attach the cover with six screws and lock washers. Do not overtighten, it will cause distortion.

Follow-on Procedure: Install evaporator section electrical module assembly. (See paragraph 4-41.)

4-50. RECTIFIER (CR1) AND CAPACITOR (C1) TEST

Conditions of test:

1. Evaporator section electrical module assembly must be connected to an operable air conditioner.
2. 208 V, 3 phase, 400 Hz power, and power cable must be available.
3. Top evaporator cover must be removed. (See paragraph 3-21)
4. Top module cover must be removed. (See paragraph 4-42.)

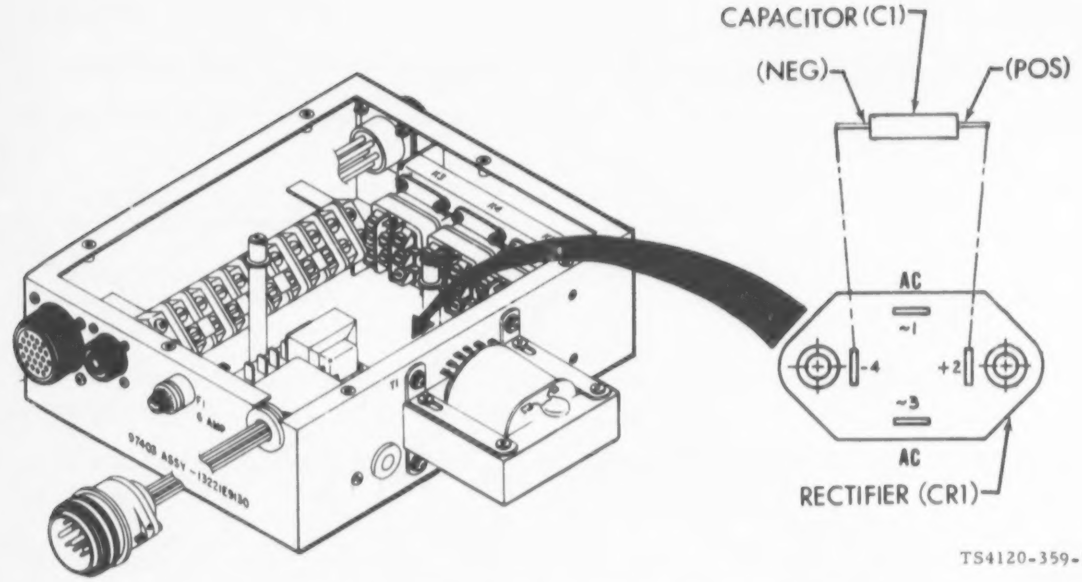

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Figure 4-50. Rectifier (CR1) and Capacitor (C1) Test

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

a. Connect power to air conditioner.

b. Turn mode selector switch to LOW HEAT.

c. Turn temperature control to maximum COOLER.

d. Using multimeter, check voltage across AC terminals of CR1.

Voltage should be 27 to 33 Vac.

e. Using multimeter, check voltage across + and - terminals of CR1. Voltage should be 25 to 31 Vdc. If voltage is low or there is no voltage, rectifier should be changed.

f. Remove power to air conditioner.

g. Check capacitor for evidence of overheating. Replace if discolored or damaged.

4-51. RECTIFIER (CR1) AND CAPACITOR (C1)

For tests, see paragraph 4-50.

Preliminary Procedures: Remove evaporator section electrical module assembly. (See paragraph 4-41.)

a. Access

(1) Using screwdriver, remove six screws and lock washers.

(2) Lift top cover off.

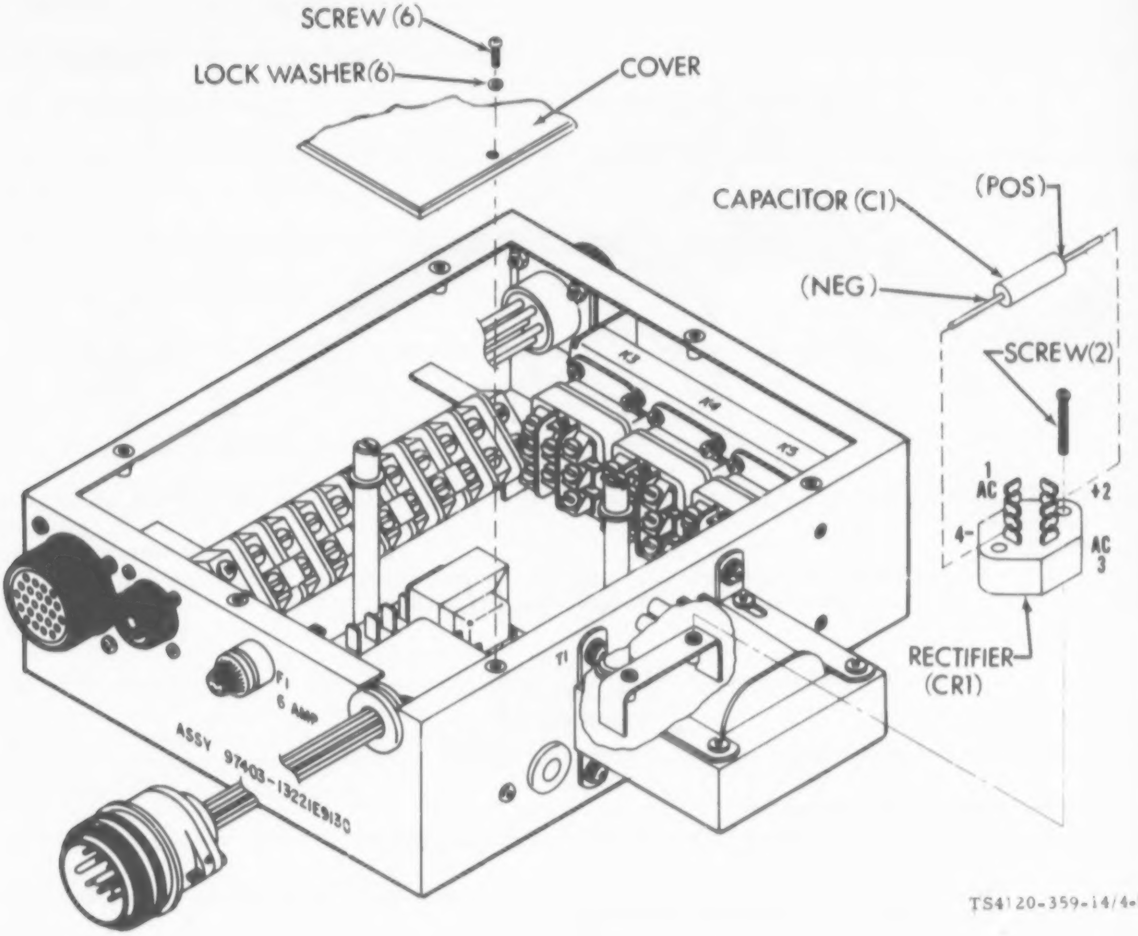

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Figure 4-51. Rectifier (CR1) and Capacitor (C1)

b. Inspect

(1) Check for loose or broken components. Replace if loose or broken components are found.

(2) Check for loose terminal connections. Repair loose connections.

c. Removal

(1) Using screwdriver, remove two screws that hold rectifier.

(2) Move rectifier out slightly.

(3) Tag leads.

(4) Unsolder leads and remove capacitor.

(5) Lift rectifier out.

d. Installation

(1) Match wire leads and capacitor to rectifier, using tags, wire markings, and wiring diagram figure 4-3.

(2) Solder leads and capacitor to rectifier.

(3) Remove tags.

(4) Place rectifier in box and aline holes.

(5) Using screwdriver, secure rectifier with two screws.

(6) Place cover on box and line up holes.

(7) Using screwdriver, attach the cover with six screws and lock washers. Do not overtighten, it will cause distortion.

Follow-on Procedure: Install evaporator section electrical module assembly. (See paragraph 4-41.)

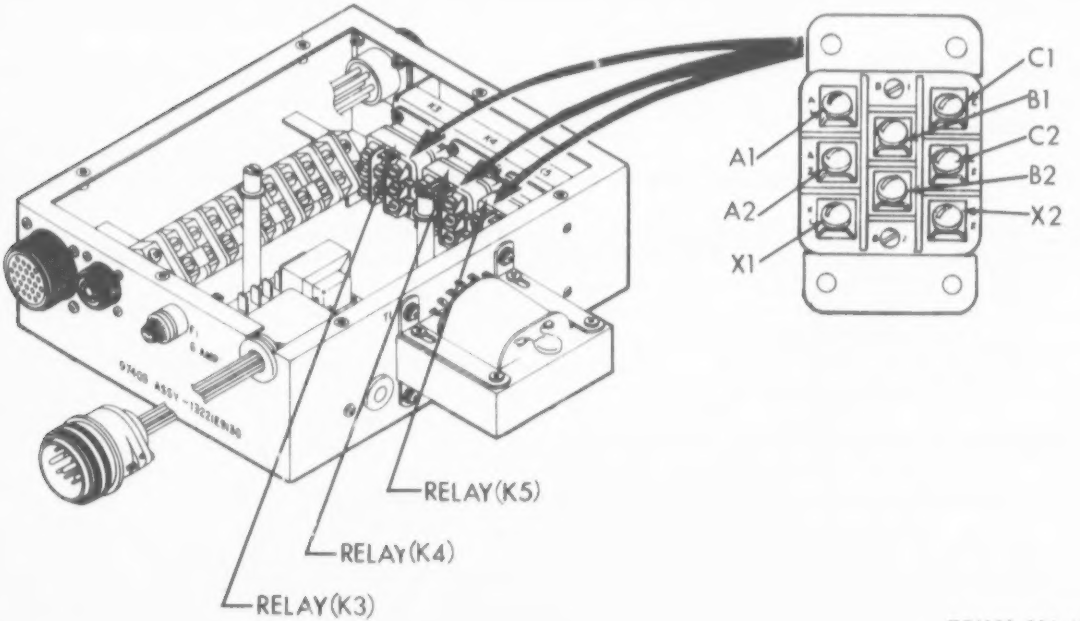
4-52. RELAYS (K3, K4, AND K5) TEST

Conditions of test: 1. Evaporator section electrical module assembly must be connected to an operable air conditioner and remote control assembly.

2. 208V, 3 phase, 400 Hz power, and power cable must be available.

3. Top evaporator cover must be removed. (See paragraph 3-21.)

4. Top module cover must be removed. (See paragraph 4-42.)



TS4120-359-14/4-52

Figure 4-52. Relay (K3, K4, and K5) Test

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

a. Connect power to air conditioner.

b. To test relay K3:

(1) Turn mode selector switch to LOW HEAT and temperature control switch to maximum COOLER.

(2) Using multimeter, check voltage (power out) between K3 terminals:

A2 and B2

B2 and C2

A2 and C2

Voltage should be 197 to 229 Vac.

(3) Using multimeter, check voltage (power in) between K3 terminals:

A1 and B1

B1 and C1

A1 and C1

Voltage should be 197 to 229 Vac.

(4) Using multimeter, check control voltage between K3 terminals X1 and X2. Voltage should be 25 to 31 Vdc.

(5) Turn selector switch to OFF.

c. To test relay K4:

(1) Turn mode selector switch to LOW HEAT and temperature control switch to maximum WARMER.

(2) Using multimeter, check voltage (power out) between K4 terminals:

A2 and B2

B2 and C2

A2 and C2

Voltage should be 197 to 229 Vac.

(3) Using multimeter, check voltage (power in) between K4 terminals:

A1 and B1

B1 and C1

A1 and C1

Voltage should be 197 and 229 Vac.

(4) Using multimeter, check control voltage between K4 terminals X1 and X2. Voltage should be 25 to 31 Vdc.

(5) Turn selector switch to OFF.

d. To test relay K5:

(1) Turn mode selector switch to HIGH HEAT and temperature control switch to maximum WARMER.

(2) Using multimeter, check voltage (power out) between K5 terminals:

A2 and B2

B2 and C2

A2 and C2

Voltage should be 197 to 229 Vac.

(3) Using multimeter, check voltage (power in) between K5 terminals:

A1 and B1

B1 and C1

A1 and C1

Voltage should be 197 to 229 Vac.

(4) Using multimeter, check control voltage between K5 terminals X1 and X2. Voltage should be 25 to 31 Vdc.

(5) Turn selector switch to OFF.

e. Remove power to air conditioner.

4-53. RELAYS (K3, K4, AND K5)

For tests, see paragraph 4-52.

Preliminary Procedures: Remove evaporator section electrical module assembly. (See paragraph 4-41.)

a. Access

(1) Using screwdriver, remove six screws and lock washers.

(2) Lift top cover off.

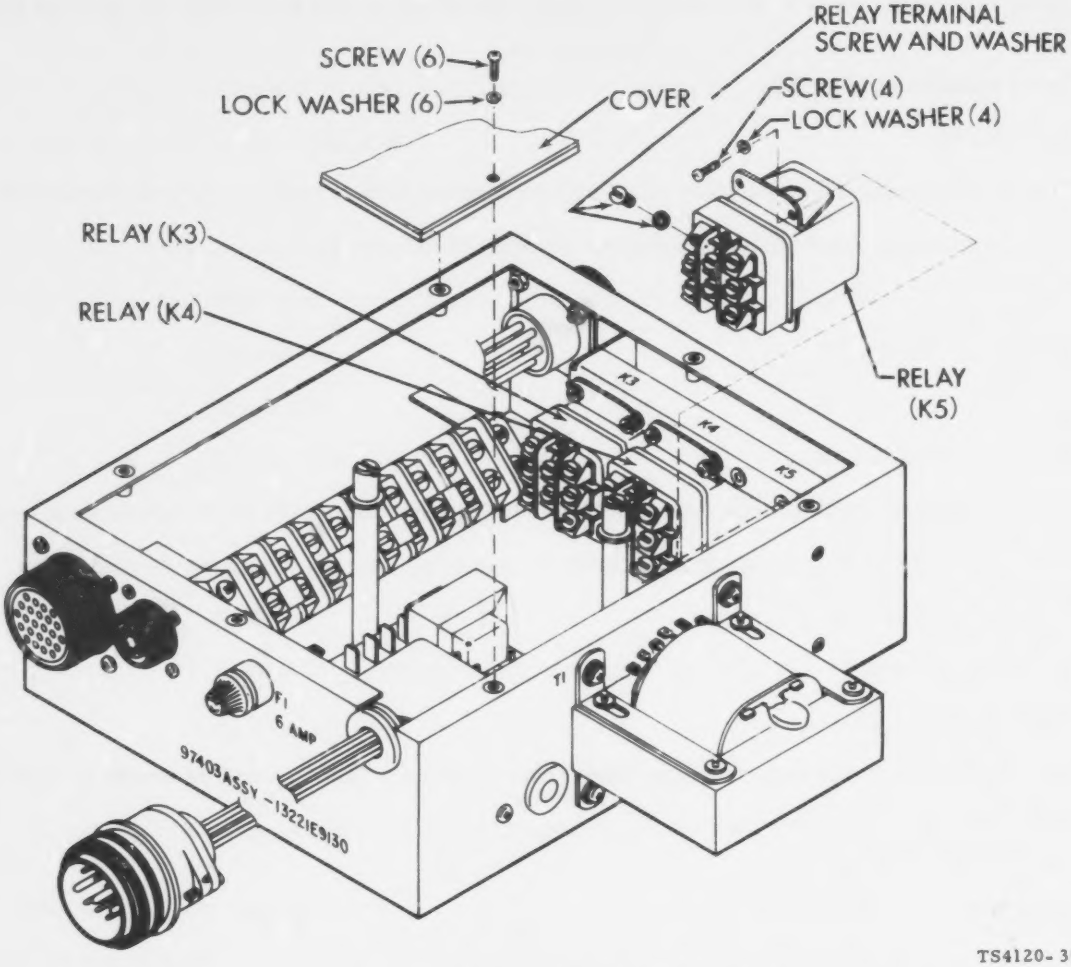


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Figure 4-53. Relay (K3, K4 and K5)

NOTE

The following instructions apply to all three K3, K4, and K5 relays.

b. Inspect

(1) Check for loose terminal connections. Repair or replace all loose connections.

(2) Check relays for cracks, evidence of overheating and other visible damage. Replace if damaged.

c. Removal

(1) Tag leads.

(2) Using flat tip screwdriver, remove screws and washers holding leads to relay terminals.

(3) Using cross tip screwdriver, remove four screws and lock washers that hold relay.

(4) Remove relay.

d. Installation

(1) Place relay in box and aline holes.

(2) Using cross tip screwdriver, secure relay to box with four screws and lock washers.

(3) Match leads to relay terminals using tags, wire marking and wiring diagram figure 4-3.

(4) Using flat tip screwdriver, secure leads to relay terminals.

(5) Remove tags.

(6) Place cover on box and line up holes.

(7) Using screwdriver, attach the cover with six screws and lock washers. Do not overtighten, it will cause distortion.

Follow-on Procedure: Install evaporator section electrical module assembly. (See paragraph 4-41.)

4-54. TERMINAL BOARD (TB1) AND JUMPERS

Preliminary Procedures: Remove evaporator section electrical module assembly. (See paragraph 4-41.)

a. Access

(1) Using screwdriver, remove six screws and lock washers.

(2) Lift top cover off.

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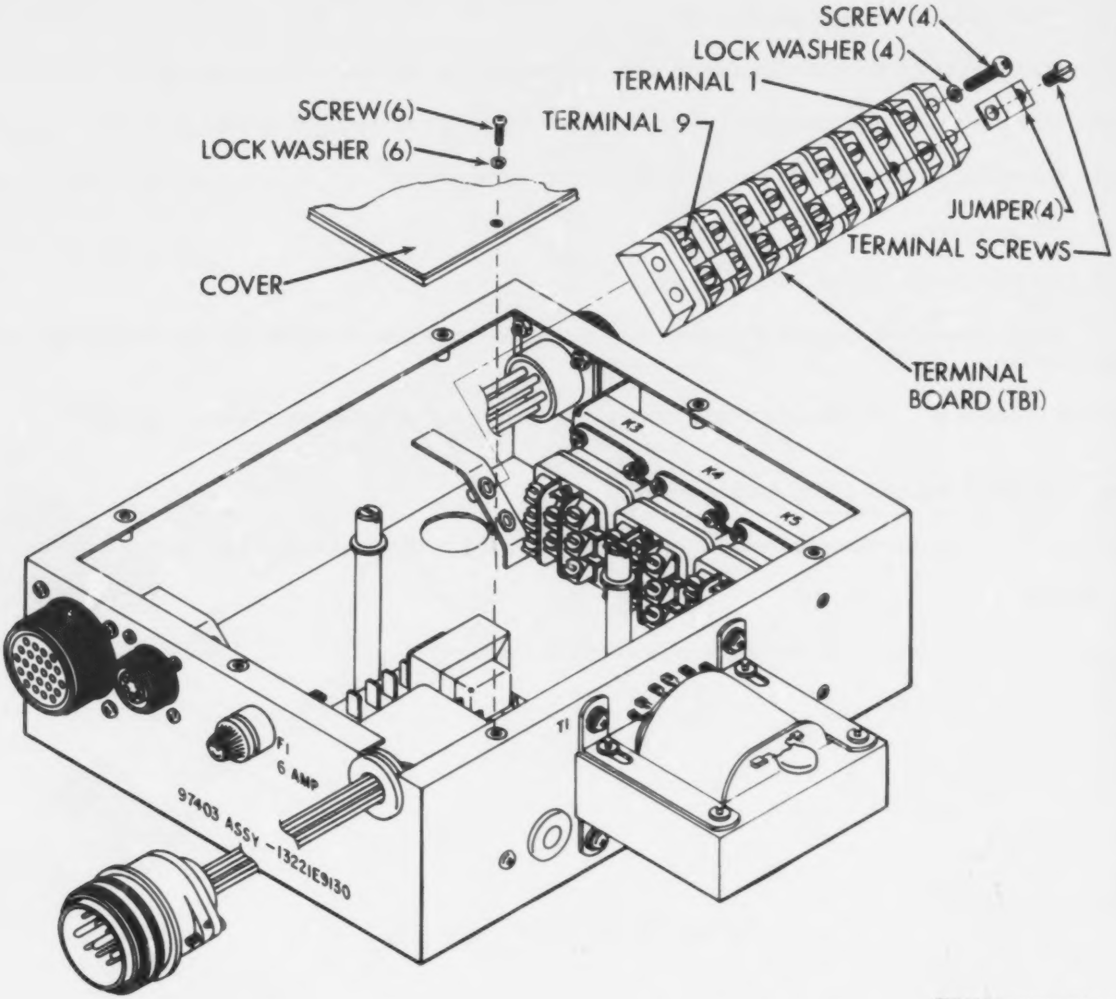

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Figure 4-54. Terminal Board (TB1) and Jumpers

b. Inspection

(1) Check terminal board for loose or corroded terminals, cracks, and obvious damage. Replace if terminals are corroded, or if terminal board is cracked or broken.

(2) Check that jumpers are in place and in good condition. Terminals 2 and 3, 4 and 5, 6 and 7, and 8 and 9 should be jumped.

c. Removal

(1) Tag wires.

(2) Use flat tip screwdriver to remove terminal screws and remove leads and jumpers.

(3) Using cross tip screwdriver, remove four screws and lock washers that hold terminal board.

(4) Remove terminal board.

d. Installation

(1) Aline terminal board and box mounting holes.

(2) Using cross tip screwdriver, secure terminal board with four screws and lock washers.

(3) Using flat tip screwdriver, install jumpers between terminals 2 and 3, 4 and 5, 6 and 7, and 8 and 9.

(4) Match leads to terminals using tags, wire markings, and wiring diagram figure 4-3.

(5) Using flat tip screwdriver, fasten leads and jumpers to terminals.

(6) Remove tags.

(7) Place cover on box and line up holes.

(8) Using screwdriver, attach the cover with six screws and lock washers. Do not overtighten, it will cause distortion.

Follow-on Procedure: Install evaporator section electrical module assembly. (See paragraph 4-41.)

4-55. CHASSIS, EVAPORATOR ELECTRICAL MODULE

Preliminary Procedures: 1. Remove evaporator section electrical module assembly. (See paragraph 4-41.)

2. Remove top cover. (See paragraph 4-42.)

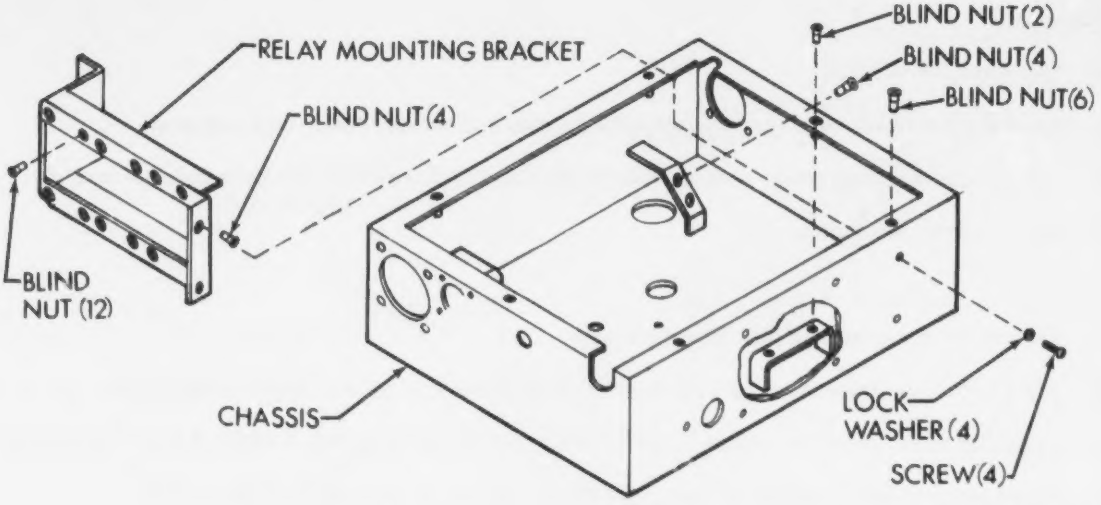
a. Inspect

(1) Check that chassis and relay mounting bracket are not cracked, broken, or badly dented. Replace if damaged.

(2) Check that blind nuts are in place and secure. Replace if loose or missing.

b. Repair

(1) Repairs are limited to replacement of relay mounting bracket and blind nuts.



TS4120-359-14/4-55

Figure 4-55. Chassis, Evaporator Electrical Module

(2) Remove component(s) from area to be repaired.

(3) Blind nuts may be removed by drilling them out using a drill bit slightly smaller than the body diameter of the blind nut. A new one must then be installed.

c. Replacement/Disassembly/Reassembly

Should it become necessary to replace the chassis, see paragraphs 4-43 through 4-54, for removal and installation of internal components.

Follow-on Procedure: 1. Install top cover. (See paragraph 4-42.)

2. Install evaporator section electrical module. (See paragraph 4-41.)

4-56. CONDENSER COVER REPAIR

For removal, inspection, cleaning, and installation, see paragraph 3-24.

a. Repair

(1) Minor rips, cuts, tears, or punctures may be repaired by applying a patch to the inside surface.

(2) Metallic grommets and snap fasteners may be replaced if surrounding material is not damaged.

b. Replace. For damage of greater extent or if cover material is damaged so that metallic grommets and snap fasteners cannot be replaced, replace the entire cover.

4-57. HARNESSES AND LEADS, CONDENSER ASSEMBLY

Preliminary Procedures:
1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove (evaporator) access cover. (See paragraph 3-14.)
3. Remove top condenser cover. (See paragraph 3-25.)
4. Remove right end condenser cover. (See paragraph 3-26.)
5. Remove left end condenser cover. (See paragraph 3-27.)

a. Removal

(1) To remove P9A wiring harness:

- Disconnect P9A connector plug at evaporator or access box.
- Using screwdriver and wrench, remove screw, nut, and clamp. (Also holds P2 harness.)
- Tag and remove leads to terminal board TB4 and ground E3.

(2) To remove P2 wiring harness:

- Disconnect P2 connector plug at evaporator access box.
- Using screwdriver and wrench, remove screw, nut, and clamp. (Also holds P9A harness.)
- Tag and remove leads to terminal board TB4 and ground E3.

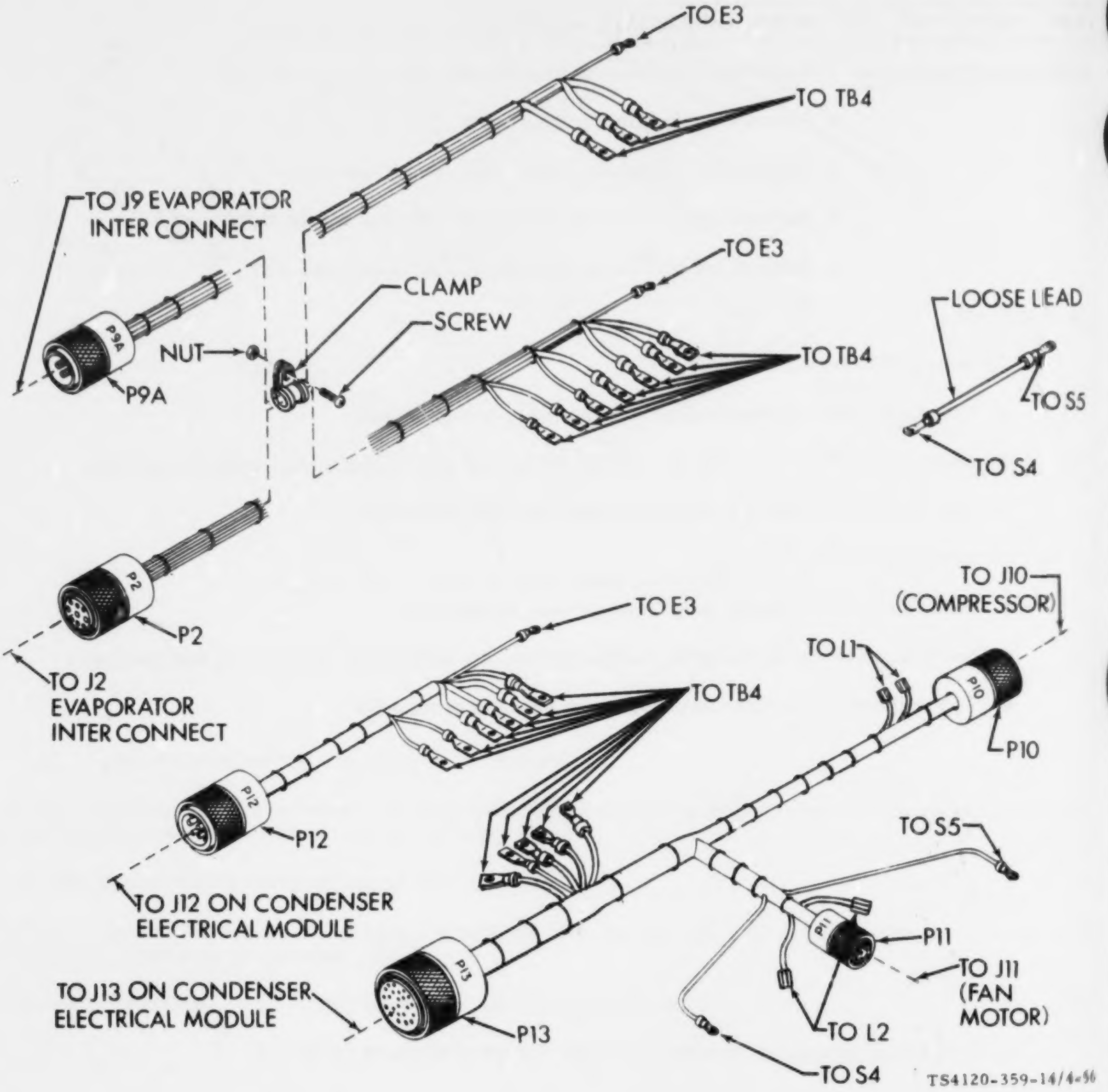


Figure 4-56. Harnesses and Leads, Condenser Assembly

(3) To remove P12 wiring harness:

- Disconnect P12 connector plug from back of condenser electrical module.
- Tag and remove leads to terminal board TB4 and E3 ground.

(4) To remove P10, P11, and P13 harness:

- Disconnect P10 connector plug from compressor.
- Disconnect P11 connector plug from fan motor.
- Disconnect P13 connector plug from back of condenser electrical module.
- Tag and remove leads to terminal board TB4, switches S4 and S5 and solenoid valves L1 and L2.

(5) To remove lead S4 to S5:

- Tag and remove.

b. Inspect/Test

(1) Check connectors for general condition, loose, broken, or missing contacts. Replace connectors if damaged.

(2) Check individual wires for loose solder connections, cut or frayed insulation, and cut or broken wires.

(3) See wiring diagram, figure 4-3, and continuity test individual wires. Repair or replace wires with no continuity.

c. Repair

(1) See paragraph 4-3 for general wire repair instructions.

(2) See table 4-2, Wire List, for wire lengths and terminals information when individual wires are replaced.

d. Installation

(1) To install P9A wiring harness:

- Connect P9A to J9 at evaporator access box.
- See tags, wire marking, and wiring diagram figure 4-3.
- Install leads on terminal board TB4 and ground E3. Remove tags.
- Using screwdriver and wrench, install clamp, screw, and nut. (Also holds P2 harness.)

(2) To install P2 wiring harness:

- Connect P2 to J2 at evaporator access box.
- See tags, wire marking, and wiring diagram figure 4-3.
- Install leads on terminal board TB4 and ground E3. Remove tags.
- Using screwdriver and wrench, install clamp, screw, and nut. (Also holds P9A harness.)

(3) To install P12 wiring harness:

- Connect P12 to J12 on back of condenser electrical module.
- See tags, wire marking, and wiring diagram figure 4-3. Install leads on terminals board TB4 and ground E3. Remove tags.

(4) To install P10, P11, and P13 harness:

- Connect P10 to J10 on compressor.
- Connect P11 to J11 on fan motor.
- Connect P13 to J13 on back of condenser electrical module.
- See tags, wire marking, and wiring diagram figure 4-3. Install leads on terminal board TB4, switches S4 and S5, and solenoid valves L1 and L2. Remove tags.

(5) To install lead S4 to S5:

- See tags, wire marking, and wiring diagram, figure 4-3.
- Install lead from S4 to S5. Remove tags.

Follow-on Procedures:
1. Install left end condenser cover. (See paragraph 3-27.)
2. Install right end condenser cover. (See paragraph 3-26.)
3. Install top condenser cover. (See paragraph 3-25.)
4. Install access cover. (See paragraph 3-14.)
5. Install air conditioner on shelter. (See paragraph 3-6.)

4-58. VARISTORS (RV1, RV2, AND RV3) AND TERMINAL BOARD (TB4)

Preliminary Procedures:
1. Disconnect power.
2. Remove right end condenser cover. (See paragraph 3-26.)

a. Inspect

(1) Check varistors for cracks, broken leads, and evidence of overheating. Replace if damaged.

(2) Check terminal board for loose or corroded terminals, cracks, and obvious damage. Replace if terminals are corroded, or if terminal board is cracked or broken.

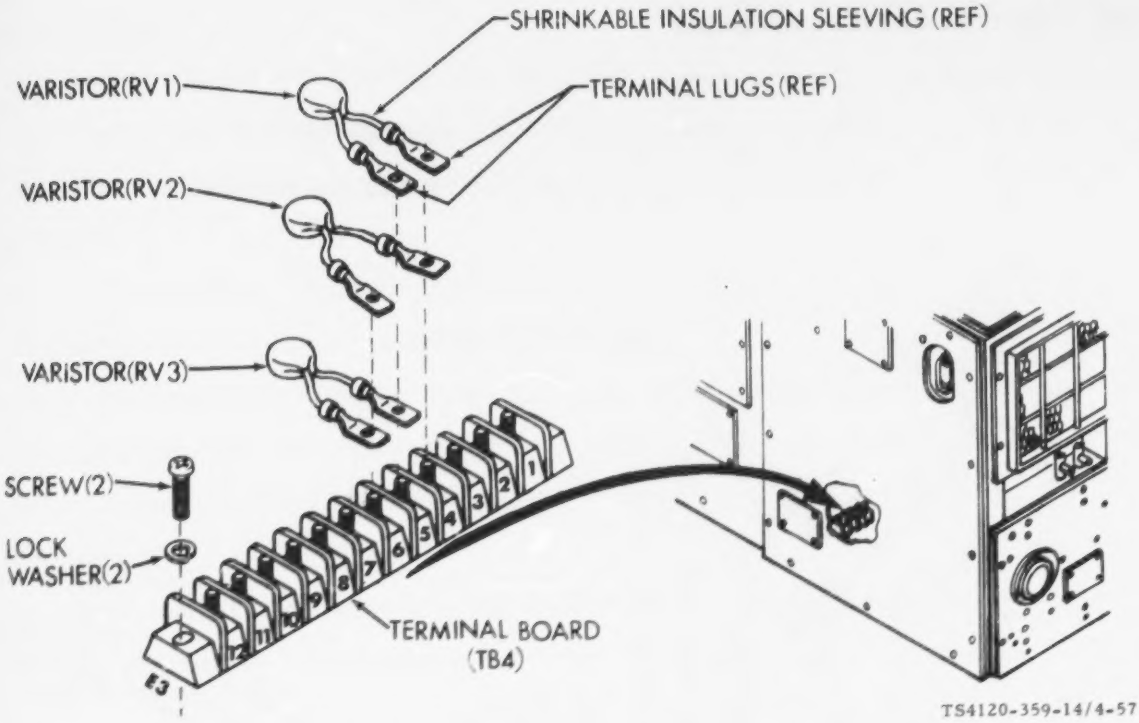


Figure 4-57. Varistors (RV1, RV2, and RV3) and Terminal Board (TB4)

b. Removal

(1) Tag and remove leads and varistors.

(2) Using screwdriver, remove two screws and lock washers and remove terminal board.

c. Repair/Replace Varistor and Terminals

(1) Cut heat shrinkable tubing to approximately one-half inch (1.27 cm) long.

(2) Slip heat shrinkable tubing over leads.

(3) Install terminal lugs.

(4) Using heat gun, shrink tubing in place.

d. Installation

(1) Using screwdriver, secure terminal board with two screws and lock washers.

(2) See tags, wire marking, and wiring diagram figure 4-3. Install leads and varistors.

(3) Remove tags.

Follow-on Procedures: 1. Install right end condenser cover. (See paragraph 3-26.)

2. Connect power.

4-59. PUSH-PULL CONTROL ASSEMBLY

Preliminary Procedures:
1. Disconnect power.
2. Remove top condenser cover. (See paragraph 3-25.)
3. Remove right end condenser cover. (See paragraph 3-26.)

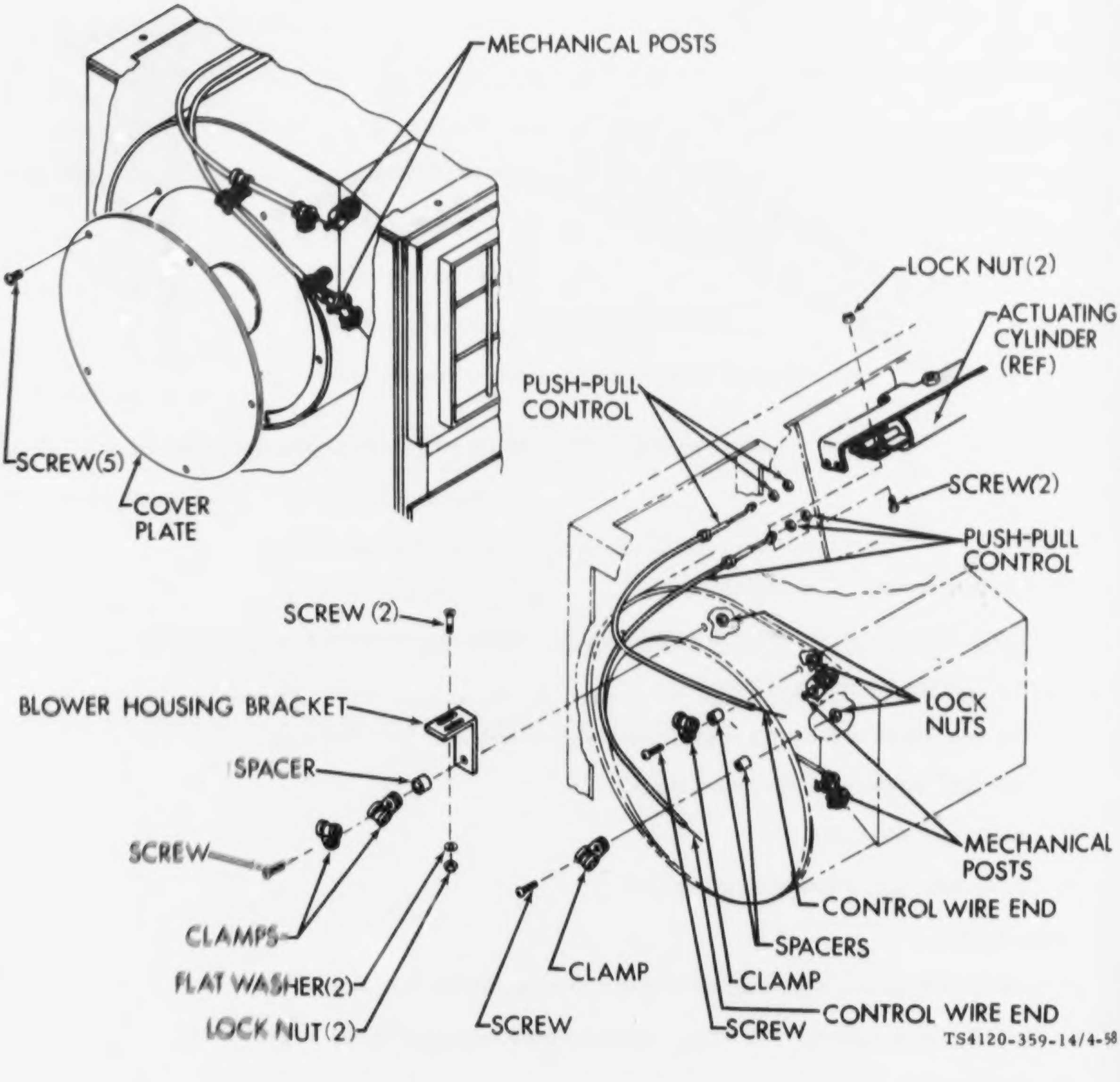


Figure 4-58. Push-Pull Control Assembly

a. Clean/Inspect

(1) Clean the linkage with a soft brush and damp rag.

(2) Check push-pull cable connections to be sure they are tight.

(3) Check that clamps are in place and secure.

b. Removal

(1) Using screwdriver, remove five screws and pull fan cover plate.

(2) Using screwdriver, loosen mechanical post screw(s).

(3) Using screwdriver and wrench, loosen screws and nuts that retain push-pull cable clamps.

(4) Using screwdriver and wrench, remove screw(s) and lock nut(s) from actuator cylinder shaft end.

(5) Pull push-pull cable(s) from clamps and remove from air conditioner.

c. Installation

(1) Place push-pull cable(s) through clamps. (Looped end of cable toward actuating cylinder.)

(2) Using screwdriver and wrench, secure the end of the push-pull cable to actuator cylinder shaft end with screw(s) and lock nut(s).

(3) Insert control wire end in mechanical post(s).

(4) Using screwdriver, secure mechanical post screw(s) while holding vane lever(s) closed. (See paragraph 4-60.d for final adjustment.)

(5) Using screwdriver and wrench, tighten screws and nuts that retain push-pull cable clamps.

CAUTION

Sheet metal screws are used to mount fan cover plate. Take care that mounting screw holes are not stripped.

(6) Using screwdriver, install fan cover plate with five screws.

Follow-on Procedures:
1. Install right end condenser cover. (See paragraph 3-26.)
2. Install top condenser cover. (See paragraph 3-25.)
3. Connect power.

4-60. OUTLET VANES AND LEVERS

Preliminary Procedures:
1. Disconnect power.
2. Remove condenser discharge grille and EMI screen. (See paragraph 3-29.)
3. Remove impeller, centrifugal fan, and extension shaft. (See paragraph 4-61.)

a. Clean/Inspect

(1) Check that louvers are not bent. Replace them if they cannot be straightened.

(2) Check that all linkages and attaching hardware are in place and secure.

(3) If louvers are dirty, clean with a soft brush or wash with water and a mild detergent solution.

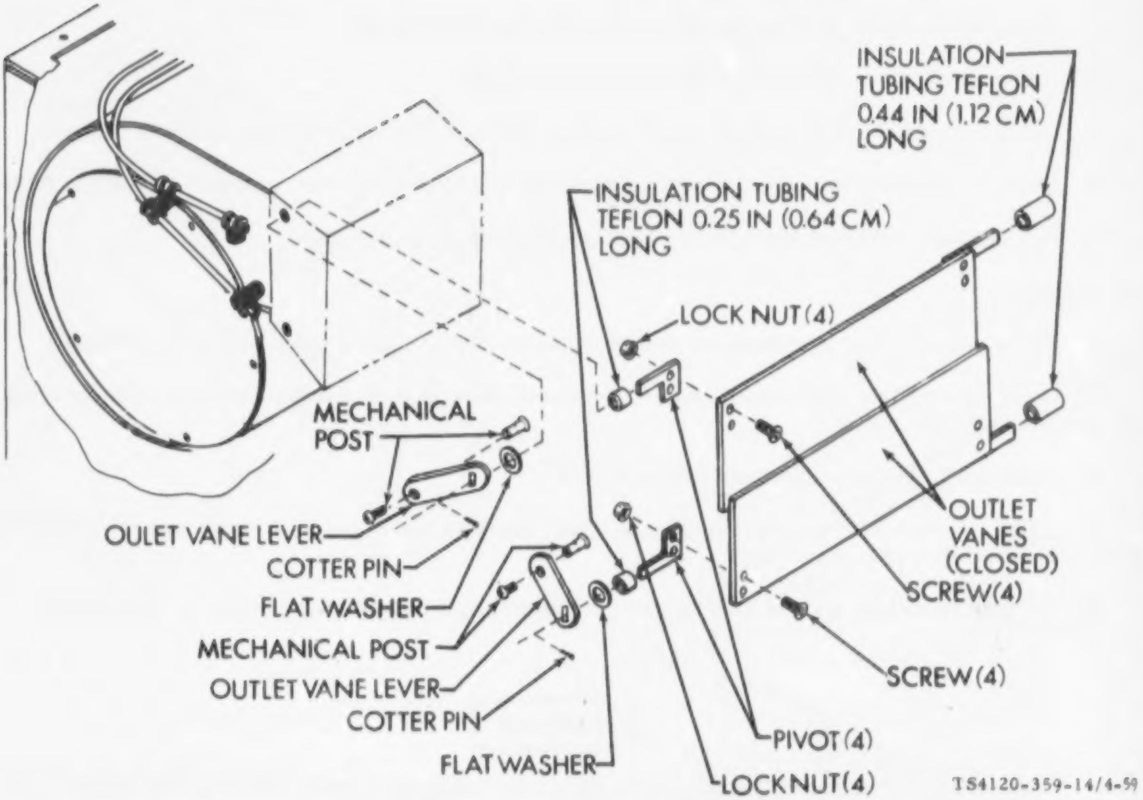


Figure 4-59. Outlet Vanes and Levers

b. Removal

(1) Using screwdriver, loosen screws in the two mechanical posts and remove the wire ends.

(2) Using pliers, remove the cotter pin(s) from the end of the pivot(s).

(3) Remove the outlet vane lever, mechanical post, flat washer, and insulation tubing (bearing) from pivot end.

(4) Using screwdriver and wrench, remove four screws and lock nuts from pivots and vane.

(5) Remove the pivots, remaining insulation tubing and vane.

(6) If the other vane is to be removed, repeat steps (4) and (5) above.

c. Installation

(1) If the insulation tubing (bearings) are to be replaced, cut new pieces to lengths shown on figure 4-59.

(2) Slip insulation tubing (bearings) over pivot ends. There are two different lengths of insulation tubing. See figure 4-59 for proper installation.

(3) Place the pivots in the blower outlet housing.

(4) Using screwdriver and wrench, install the vane on the pivots with four screws and lock nuts.

(5) If both vanes were removed, repeat steps (2), (3), and (4) above, and install the other vane.

(6) Place flat washer(s) and outlet vane lever(s) with mechanical posts installed on the pivot ends. Secure with cotter pin(s).

(7) Insert push-pull control wire end through mechanical posts.

(8) Using screwdriver, secure mechanical post screw(s) while holding the vane(s) closed.

d. Adjustment

(1) If unit has been operating, wait until unit has cooled to ambient temperature, approximately four hours.

(2) Loosen mechanical post screw(s).

(3) Close outlet vanes.

(4) Pull wire(s) tight and tighten mechanical post screw(s).

(5) Louvers must be tightly closed when air conditioner is off and head pressure is below 150 psig (10.516 kg/cm^2).

Follow-on Procedures:
1. Install impeller, centrifugal fan, and extension shaft. (See paragraph 4-61.)
2. Install condenser discharge grille and EMI screen. (See paragraph 3-29.)
3. Connect power.

4-61. IMPELLER, CENTRIFUGAL FAN AND EXTENSION SHAFT

Preliminary Procedures:
1. Disconnect power.
2. Remove top condenser cover. (See paragraph 3-25.)
3. Remove right end condenser cover. (See paragraph 3-26.)

a. Removal

(1) Using screwdriver, remove five screws and remove fan cover plate.

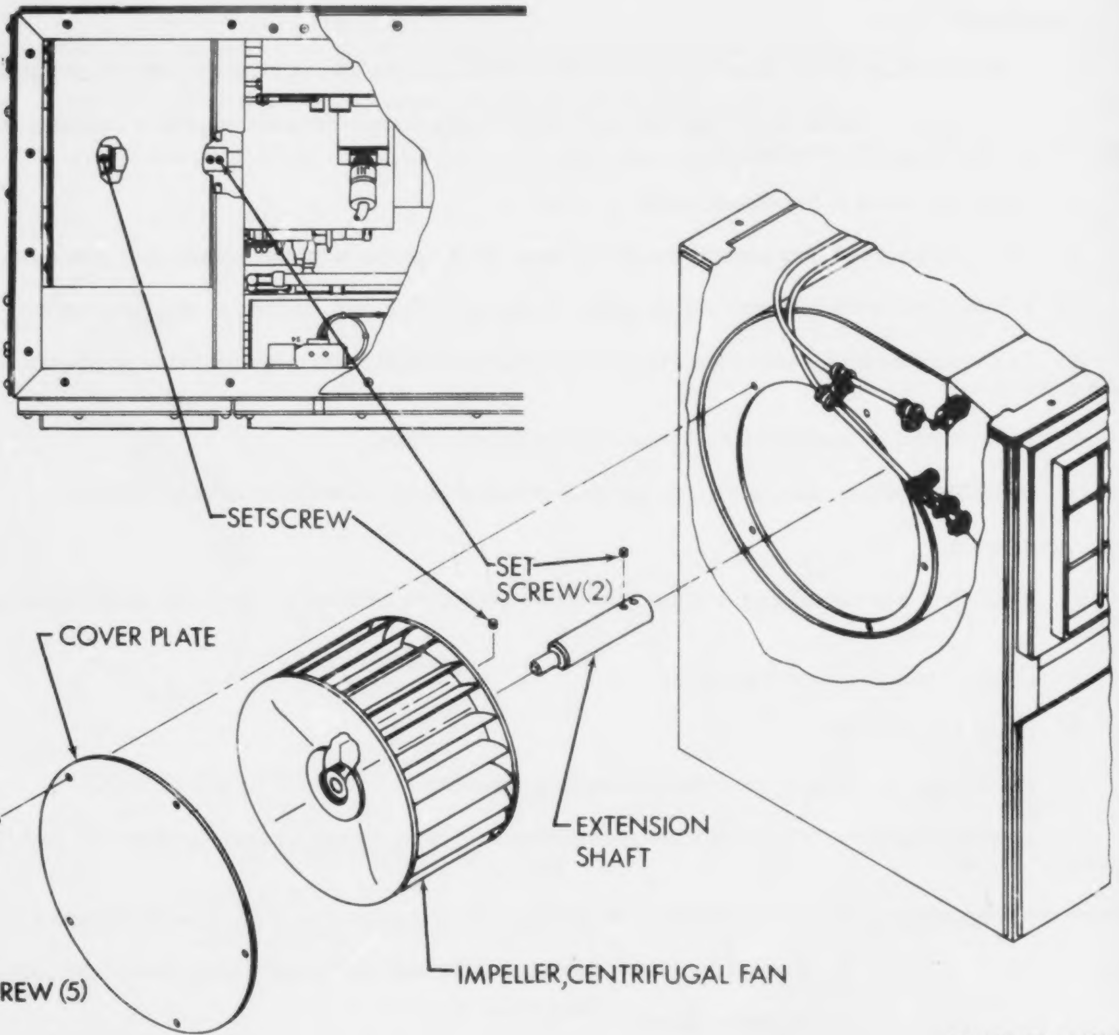


Figure 4-60. Impeller. Centrifugal Fan, and Extension Shaft

(2) Using allen wrench, loosen two setscrews holding the extension shaft to the motor shaft.

(3) Carefully pull the assembled extension shaft and impeller off of motor shaft and out of housing.

(4) Using allen wrench, loosen impeller hub setscrew and pull extension shaft from impeller.

b. Clean/Inspect

(1) Using clean dry cloth and soft brush, remove dirt from impeller, blower housing, cover plate, extension shaft, and outside of motor.

(2) Check that impeller is in good condition. Replace if it is out of round, dented, broken, or if the hub is loose.

(3) Check to see that the setscrew is not missing.

c. Installation/Alinement

(1) Aline impeller setscrew with flat surface on extension shaft.

(2) Slip impeller on extension shaft as far as possible and tighten setscrew.

(3) Slip impeller and extension shaft on to motor shaft.

(4) Position impeller for 1/8 inch (0.32 cm) clearance from inside edge of fan inlet.

(5) Aline impeller setscrews with flat surface on motor shaft.

(6) Using allen wrench, tighten two setscrews in extension shaft.

CAUTION

Sheet metal screws are used to mount fan cover plate. Take care that mounting screw holes are not stripped.

(7) Using screwdriver, secure cover plate with five screws.

(8) Spin impeller and check that it clears inlet all around.

(9) If impeller does not spin freely, increase clearance, step (4) ***slightly***.

Follow-on Procedures:

1. Install right end condenser cover. (See paragraph 3-26.)
2. Install top condenser cover. (See paragraph 3-25.)
3. Connect power.

4-62. BLOWER HOUSING AND FAN INLET

Preliminary Procedures: 1. Remove front condenser cover. (See paragraph 3-23.)

2. Remove impeller and extension shaft. (See paragraph 4-61.)

a. Removal

(1) Using screwdriver, loosen the two screws in the mechanical posts and remove the push-pull wire ends.

(2) Using screwdriver and wrench, remove the three screws and lock nuts and spacers that retain the push-pull cable clamps.

(3) Using screwdriver and wrench, remove two screws, flat washers and lock nuts, and remove blower housing bracket.

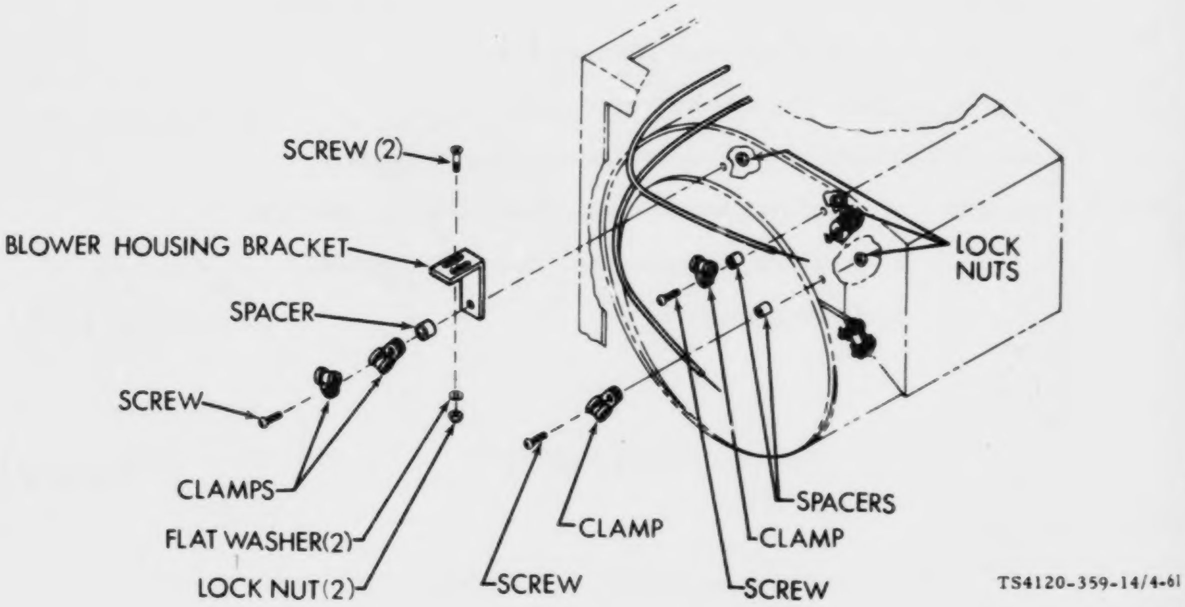


Figure 4-61. Blower Housing Right Side Clamps and Brackets

(4) Using screwdriver, remove three screws from motor side of blower housing.

(5) Pull blower from condenser housing. (See figure 4-62.)

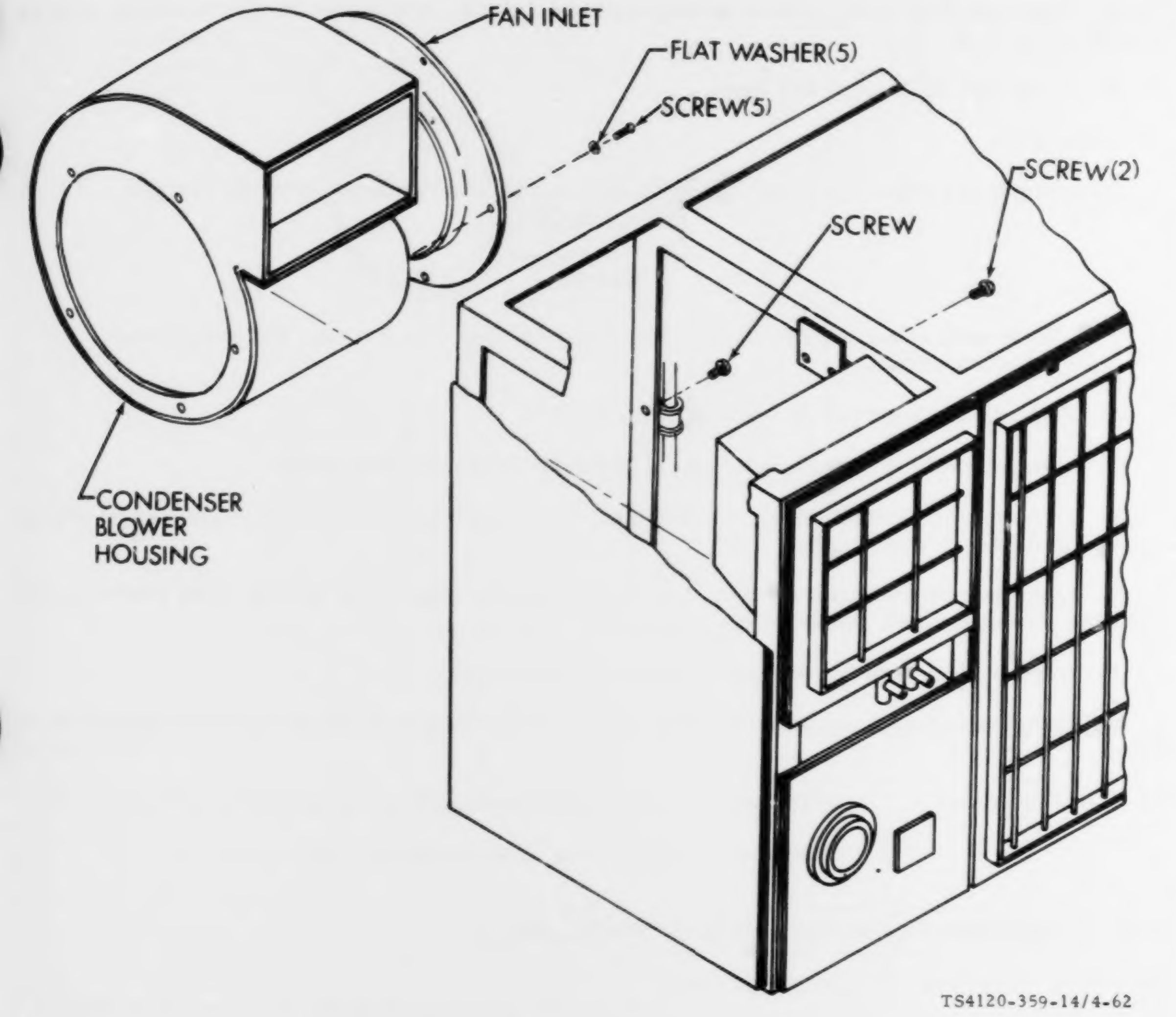


Figure 4-62. Blower Housing and Fan Inlet

(6) Using screwdriver, remove five screws and flat washers; and remove fan inlet.

b. Inspection

(1) Check that blower housing and fan inlet are not damaged. Replace them if they are bent, badly dented, or cracked.

(2) Check that plate nuts in blower housing are in place and secure. Replace them if they are loose or damaged.

c. Repair

(1) Repairs are limited to replacement of rivets and plate nuts.

(2) Plate nuts may be removed by drilling out the old rivets using a drill bit slightly smaller than the diameter of the rivet.

(3) Install new plate nut(s) and rivets.

d. Installation

(1) Using screwdriver, install fan inlet on blower housing with five screws and flat washers.

CAUTION

Sheet metal screws are used to mount fan inlet ring. Take care that mounting screw holes are not stripped.

(2) Place blower in condenser housing and aline holes.

(3) Using screwdriver, secure motor side of blower housing with three screws.

(4) Using screwdriver and wrench, secure blower housing bracket to condenser housing angle with two screws, flat washer, and lock nuts.

(5) Using screwdriver and wrench, secure the push-pull cable clamps to the side of the blower housing with three screws, spacers, and lock nuts.

(6) Insert push-pull control wire end through mechanical post.

(7) Using screwdriver, secure mechanical post screws while holding vane levers so that vanes are closed.

Follow-on Procedures: 1. Install impeller and extension shaft. (See paragraph 4-61.)

2. Install front condenser cover. (See paragraph 3-23.)

4-63. CONDENSER FAN MOTOR (B2) TEST (INSTALLED)

Preliminary Procedures: 1. Disconnect power.

2. Remove top condenser cover. (See paragraph 3-25.)

a. Test

(1) Disconnect P11 from J11.

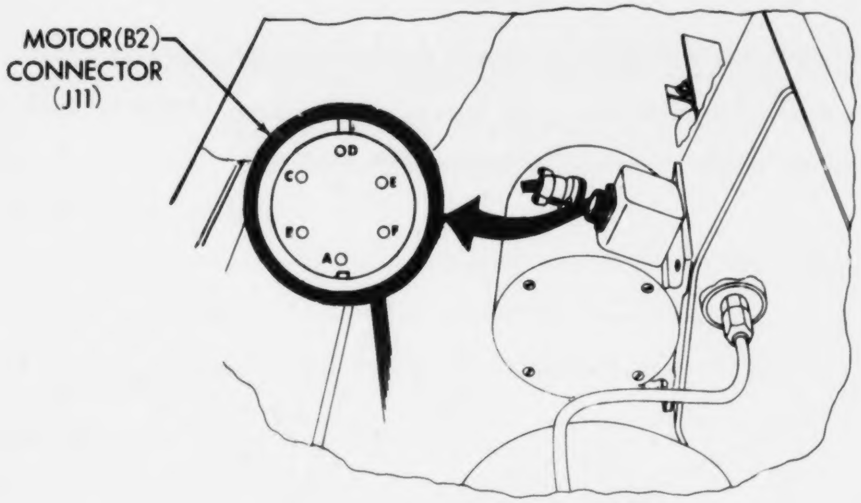


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Figure 4-63. Motor (B2) Test

(2) Using multimeter check continuity between all J11 pins and motor housing. Continuity should exist only on pin D.

(3) Using multimeter, measure 3 phase windings at J11:

A to B

B to C

A to C

All resistances should be above zero, but less than 2 ohms.

(4) Using multimeter, check J11. Pin D is *ground.* Check pins A, B, C, E, and F to pin D. There should be no reading. Check pin D to motor frame, multimeter should read 0.

(5) Using multimeter, measure resistance between pins E and F. Resistance should be *zero* meaning the switch is closed.

(6) Motor with shorted, open or grounded windings or open thermostatic switch should be replaced.

Follow-on Procedures: 1. Install top condenser cover. (See paragraph 3-25.)

2. Connect power.

4-64. MOTOR ALTERNATING CURRENT (B2)

Preliminary Procedures: 1. Disconnect power.

2. Remove top condenser cover. (See paragraph 3-25.)

a. Removal

(1) Using allen wrench, loosen two setscrews that hold extension shaft to motor shaft.

(2) Move extension shaft and impeller off of motor shaft as far as possible.

(3) Disconnect connector plug (P11) from motor connector (J11).

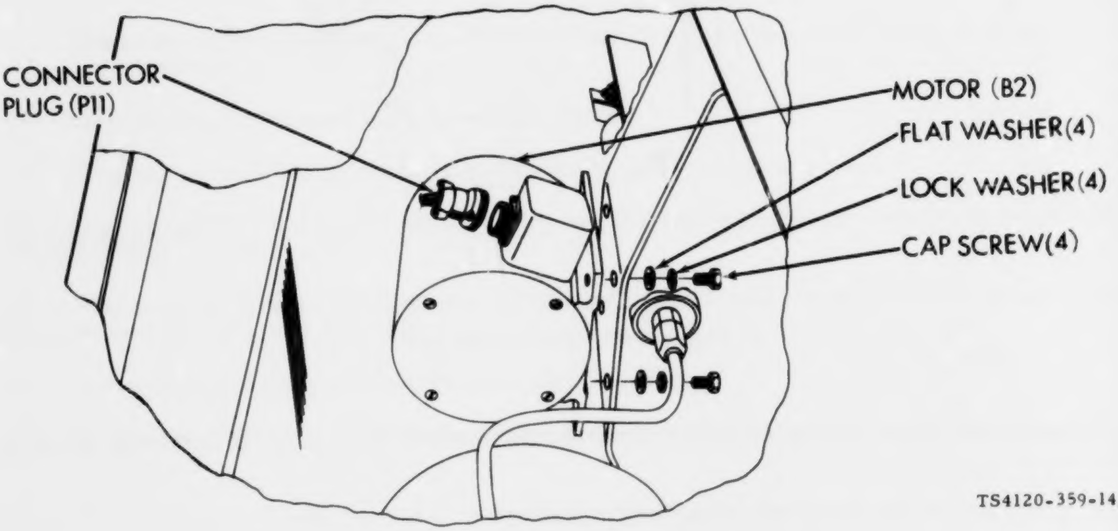

Figure 4-64. Motor (B2)

(4) While supporting motor, use socket and ratchet to remove four cap screws, lock washers, and flat washers.

(5) Carefully slip motor away from extension shaft and up and out of air conditioner.

b. Test (See paragraph 4-63.)

c. Inspection

(1) Check motor to see that it rotates freely without excessive lateral end play.

(2) Check motor for evidence of overheating.

(3) Check connector J11 for loose, damaged, or missing pins.

d. Repair. Direct support maintenance repair of the condenser fan motor is limited to the replacement of the electrical connector and the bearings. For further information on electric motor repair, refer to FM 20-31 (Electric Motor and Generator Repair).

NOTE

Motors manufactured by Welco Industries, Inc. do not come apart the same way as those manufactured by IMC Magnetics Corporation. See motor name plate to determine who made the motor.

See figure 4-66 for disassembly of Welco motors.
See figure 4-65 for disassembly of IMC motors.

(1) To replace the connector.

(a) Using screwdriver, remove the four screws from the terminal box cover.

(b) Remove the cover.

(c) Using screwdriver, remove the four screws from the connector (J11).

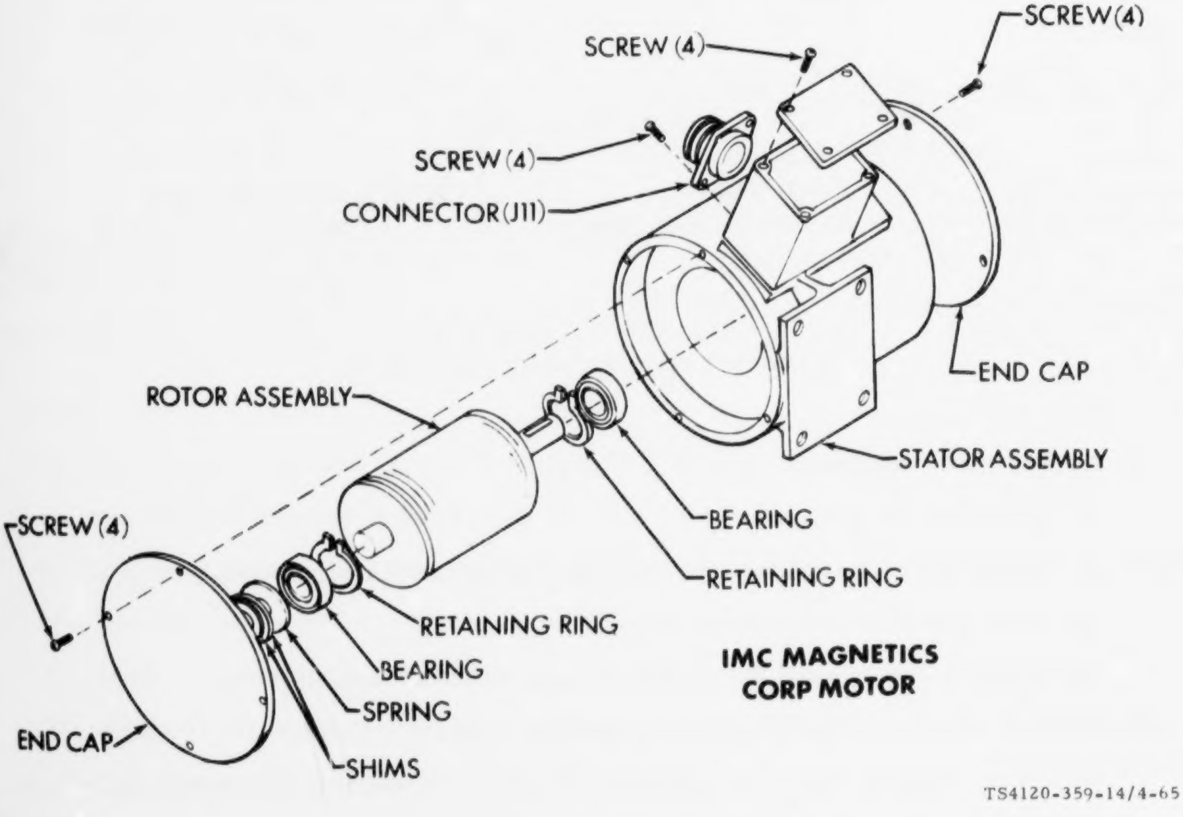

Figure 4-65. Motor (B2) IMC Magnetics Corp.

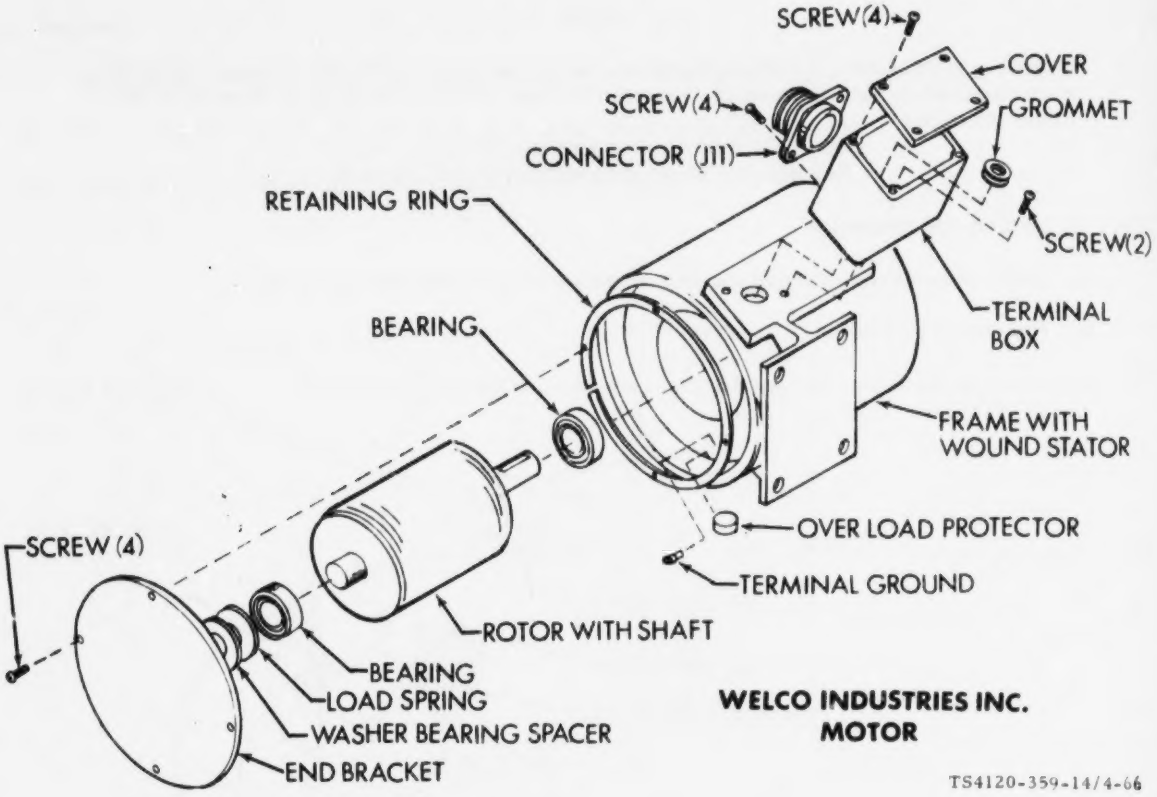

Figure 4-66. Motor (B2) Welco Industries, Inc.

(d) Tag and unsolder leads.

(e) Remove the old connector.

(f) See wiring diagram and tags and solder leads to the new connector. Remove the tags.

(g) Using screwdriver, install the connector with four screws.

(h) Using screwdriver, install the terminals box cover with four screws.

(2) To replace bearings on IMC Magnetics Corporation motors:

(a) Using screwdriver, remove four screws from each end bracket and carefully remove the end caps.

(b) Note the position and number of springs, shims, and bearings as they are removed.

(c) Remove the bearing shim(s) and load spring.

(d) Remove the bearings.

(e) Place the new bearings on the shafts.

(f) Place the spring and shim(s) back of shaft in same position as removed.

(g) Carefully place the rotor and shaft with bearings back in the motor housing.

(h) Using screwdriver, secure the end caps to the motor with eight screws and washers. Before tightening completely, spin shaft to see that it spins freely. If any rubbing is noted, adjust the end caps slightly to relieve rubbing. Finish tightening the eight screws.

(i) Check end play of shaft. End play should be 0.002-0.005 inch (0.051-0.127 mm). If end play is not within limits, disassemble motor and add or remove shims to adjust.

(3) To replace bearings on Welco Industries, Inc. motors:

(a) Using screwdriver, remove four screws and washers and carefully remove the end bracket.

(b) Carefully pull the rotor with shaft assembly from the motor housing.

(c) Note the position and number of washer bearing spacer(s), load spring, and bearings as they are removed.

(d) Remove the washer bearing spacer(s) and load spring and pull the bearings from the shafts.

(e) Place the new bearings on the shafts.

(f) Place the load spring and washer bearing spacer(s) back on shaft in same position as removed.

(g) Carefully place the rotor with shaft with bearings back in the motor housing.

(h) Using screwdriver, secure the end bracket to the housing assembly with four screws and washers. Before tightening completely, spin shaft to see that it spins freely. If any rubbing is noted, adjust the end cap slightly to relieve rubbing. Finish tightening the four screws.

(i) Check end-play of shaft. End play should be 0.002-0.005 inch (0.051-0.127 mm). If end play is not within limits, disassemble motor and add or remove shims to adjust.

e. Installation

(1) Slip the motor into place and position impeller and extension shaft loosely on motor shaft.

(2) Line up motor and bracket screw holes.

(3) Using socket and ratchet, fasten motor to bracket with four screws, lock washers, and flat washers.

(4) Aline extension shaft setscrews with flat surface on motor shaft.

(5) Position impeller for 1/8 inch clearance (measure with tape) from inside edge of fan inlet.

(6) Using allen wrench, tighten two setscrews to secure shaft extension and impeller on motor shaft.

(7) Spin impeller and check that it clears inlet all around.

(8) If impeller does not spin freely, increase clearance, step (4) *slightly*.

(9) Connect P11 connector plug to J11 motor connector.

Follow-on Procedures: 1. Install top condenser cover. (See paragraph 3-25.)

2. Connect power.

4-65. FLEXIBLE HOSE ASSEMBLY SUCTION AND DISCHARGE

Preliminary Procedures:
1. Disconnect power.
2. Remove top condenser cover. (See paragraph 3-25.)
3. Remove left end condenser cover. (See paragraph 3-27.)
4. Remove access cover. (See paragraph 3-14.)

a. Inspect/Test Installed

(1) Check for evidence of leaks.

(2) Check that metal hose, tubing and fittings are not kinked, dented, or cracked. Repair or replace if damaged.

(3) Leak test in accordance with paragraph 4-8, if a leak is indicated or suspected.

b. Remove/Replace (complete hose assembly)

NOTE

If a complete flexible hose assembly is to be replaced, it is not necessary to discharge the refrigerant system unless reason for replacement is a leak in hose.

(1) Using wrench, loosen and disconnect hose end at evaporator assembly through access opening.

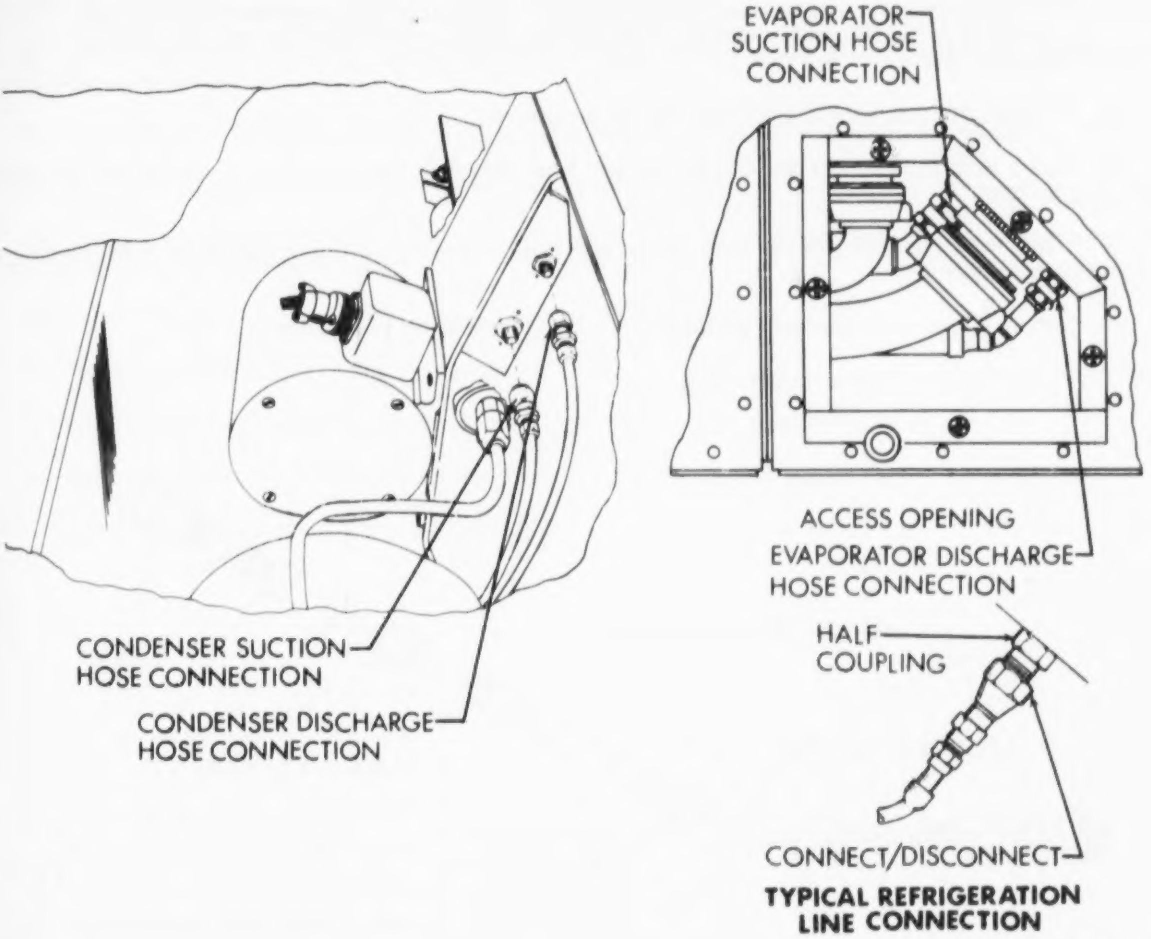
EVAPORATOR SUCTION HOSE CONNECTION
ACCESS OPENING
EVAPORATOR DISCHARGE HOSE CONNECTION
CONDENSER SUCTION HOSE CONNECTION
CONDENSER DISCHARGE HOSE CONNECTION
HALF COUPLING
CONNECT/DISCONNECT
TYPICAL REFRIGERATION LINE CONNECTION

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Figure 4-67. Flexible Hose Connection Points

(2) Using knife, cut and remove the two joined tie down straps that secure hoses to compressor junction box.

(3) Using wrench loosen and disconnect hose end at condenser assembly located on motor mounting bracket.

(4) Carefully remove hose from air conditioner.

c. Installation (complete hose assembly)

NOTE

If a complete factory assembled hose assembly is installed, it is not necessary to evacuate and charge the refrigerant system, if the half couplings closed properly and the charge was not lost.

(1) Position the new hose assembly in the air conditioner.

(2) Using wrench, connect the condenser end hose fitting to half coupling at condenser fan motor mounting bracket.

(3) Using wrench, connect the evaporator end hose fitting to half coupling at access opening in evaporator assembly.

(4) Secure hoses to compressor junction box with two joined tie down straps.

d. Disassembly/Reassembly suction hose.

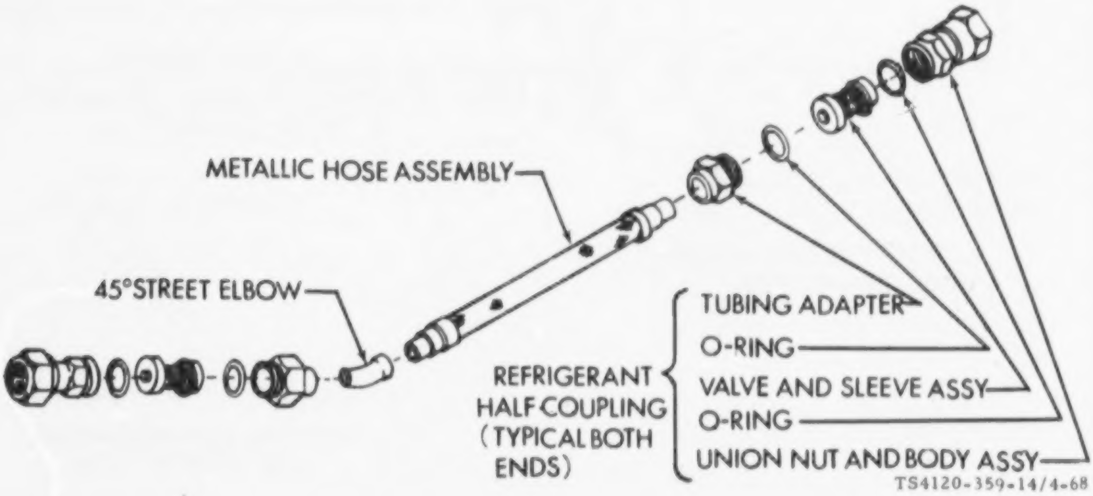

Figure 4-68. Suction Hose

(1) Discharge the refrigerant system. (See paragraph 4-5.)

(2) Remove the hose from the air conditioner. See b. (1) through (4) and figure 4-67.

(3) Use two wrenches. Using one wrench to hold the tubing adapter, carefully remove the union nut and body assembly.

(4) Remove the two O-rings, valve, and sleeve assembly.

(5) If the opposite end coupling is damaged, or if any brazing/debrazing is to be done, repeat steps (3) and (4) and remove half coupling from opposite end.

(6) If metallic hose, 45° street elbow, or tubing adapters are damaged, see paragraph 4-7 and debraze parts to be replaced.

(7) If metallic hose, 45° street elbow, or tubing adapters are being replaced, clean all joints and braze parts per paragraph 4-7.

(8) Oil O-rings liberally with refrigerant oil, item 13, Appendix E. This will prevent them from scuffing and tearing when assembled.

(9) Place smaller O-ring on valve and sleeve assembly and larger O-ring on tubing adapter.

(10) Slip the valve and sleeve assembly with O-ring into the body.

(11) Using a wrench to hold the tubing adapter, tighten the union nut and body assembly and torque to 35-45 foot pounds (48-61 newton meters).

(12) Install the hose in the air conditioner. See c. (1) through (4).

(13) Replace the dehydrator. (See paragraph 4-73.)

(14) Leak test the hose, dehydrator and joints in the repair area. (See paragraph 4-48.)

(15) Evacuate and charge the refrigerant system in accordance with paragraphs 4-9 and 4-10.

e. Disassembly/Reassembly discharge hose

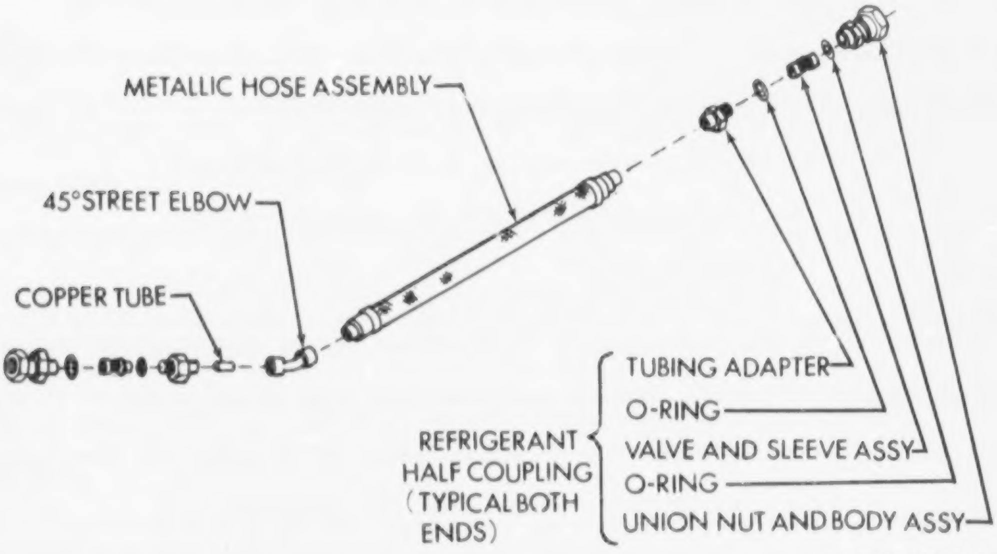

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Figure 4-69. Discharge Hose

(1) Discharge the refrigerant system. (See paragraph 4-5.)

(2) Remove the hose from the air conditioner. See b. (1) through (4) and figure 4-67.

(3) Use two wrenches. Using one wrench to hold the tubing adapter, carefully remove the union nut and body assembly.

(4) Remove the two O-rings and valve and sleeve assembly.

(5) If the opposite end coupling is damaged or if any brazing/debrazing is to be done, repeat steps (3) and (4), and remove half coupling from opposite end.

(6) If metallic hose, copper tube, 45° tube elbow, or tubing adapters are damaged, see paragraph 4-7 and debraze parts to be replaced.

(7) If metallic hose, copper tube, 45° tube elbow, or tubing adapters are being replaced, clean all joints and braze parts per paragraph 4-7.

(8) Oil O-ring liberally with refrigerant oil, item 13, Appendix E. This will prevent them from scuffing and tearing when assembled.

(9) Place smaller O-ring on valve and sleeve assembly and larger O-ring on tubing adapter.

(10) Slip the valve and sleeve assembly with O-ring into the body.

(11) Using a wrench to hold the tubing adapter tighten the union nut and body assembly and torque to 15-20 foot pounds (20-27 newton meters).

(12) Install the hose in the air conditioner. See c. (1) through (4).

(13) Replace the dehydrator. (See paragraph 4-73.)

(14) Leak test the hose, dehydrator, and joints in the repair area. (See paragraph 4-48.)

(15) Evacuate and charge the refrigerant system in accordance with paragraphs 4-9 and 4-10.

Follow-on Procedures:

1. Install access cover. (See paragraph 3-14.)
2. Install left end condenser cover. (See paragraph 3-27.)
3. Install top condenser cover. (See paragraph 3-25.)
4. Connect power.

4-66. COUPLING HALF, MALE (CONDENSER REFRIGERANT PIPING DISCONNECT)

Preliminary Procedures:

1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Separate evaporator and condenser section assemblies. (See paragraph 4-14.)
3. Remove front condenser cover. (See paragraph 3-23.)

a. General. The coupling half fittings (hose disconnect fittings) used for joining the interconnecting refrigerant metal hoses, contain a poppet valve assembly to prevent refrigerant loss and to keep air from entering the line when hoses are disconnected. The following instructions apply to both the suction (low pressure) and discharge (high pressure) couplings.

b. Inspect. Check couplings for cracks, breaks, loose connections, and evidence of leakage. Repair or replace defective parts.

c. Test. Leak test in accordance with paragraph 4-8.

d. Repair or Replacement. All repairs other than tightening of screw joints will require disassembly and replacement of some parts. When the half couplings are disassembled for any reason, the O-rings and gaskets should be replaced.

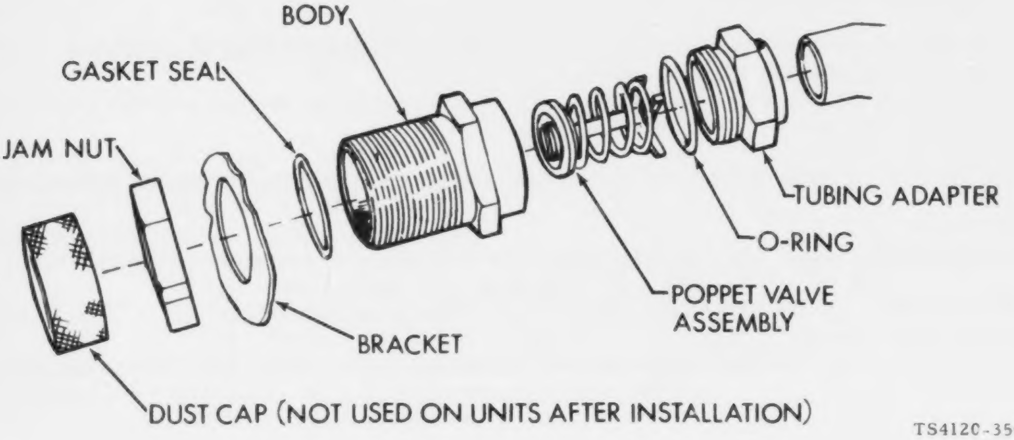

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Figure 4-70. Male Coupling Half

(1) Discharge the refrigerant system. (See paragraph 4-5.)

(2) Using wrench, carefully disconnect the suction and discharge condenser to evaporator refrigerant metal hose line connectors from the coupling halves. (See figure 4-67.)

(3) Using wrench, remove the jam nut.

(4) Carefully spring the tubing back enough to gain access to the hexes on the body and tubing adapter.

(5) Use two wrenches. Using one wrench to hold the tubing adapter, carefully remove the valve body. Carefully spring tubing back enough to remove the half coupling body, the poppet valve assembly, the O-ring, and the gasket seal.

(6) Inspect the tubing adapter for cracks and damaged threads. If defective, note position of tubing adapter and hex. Debraze the tubing adapter in accordance with instructions in paragraph 4-7.

e. Installation

(1) If the tubing adapter was removed, braze a new one in place in original position in accordance with instructions in paragraph 4-7.

(2) Oil O-ring liberally with refrigerant oil, item 13, Appendix E. This will prevent it from scuffing and tearing when coupling body is threaded into adapter.

(3) Place O-ring on tubing adapter.

(4) Insert poppet valve assembly into body.

(5) Carefully engage the threads of the body and tubing adapter.

(6) Use two wrenches. Use one wrench to hold the tubing adapter and the other to tighten the half coupling body to: suction line (larger) 35-45 foot pounds (48-61 newton meters), discharge line (smaller) 15-20 foot pounds (20-27 newton meters).

(7) Slip the gasket seal over the threaded body end and place body threaded end through the bracket.

(8) Using wrench, tighten jam nut.

(9) Using wrench, carefully reconnect the suction and discharge condenser to evaporator refrigerant metal hose line connectors to the coupling halves.

(10) Replace the dehydrator. (See paragraph 4-73.)

(11) Leak test the coupling halves, the dehydrator, and joints in the repair area in accordance with paragraph 4-8.

(12) Evacuate and charge the refrigerant system in accordance with paragraphs 4-9 and 4-10.

Follow-on Procedures:
1. Install front condenser cover. (See paragraph 3-23.)
2. Connect evaporator and condenser section assemblies. (See paragraph 4-14.)
3. Install air conditioner on shelter. (See paragraph 3-6.)

4-67. CAP AND CHAIN AND INSPECTION OF SERVICE VALVES

a. Inspect

(1) Examine LOW SIDE and HIGH SIDE service valves and caps for clean threads.

(2) If dirty, male flare connections and threads should be cleaned. Protective caps should be screwed on.

(3) Missing caps or caps with broken or missing chains, should be replaced.

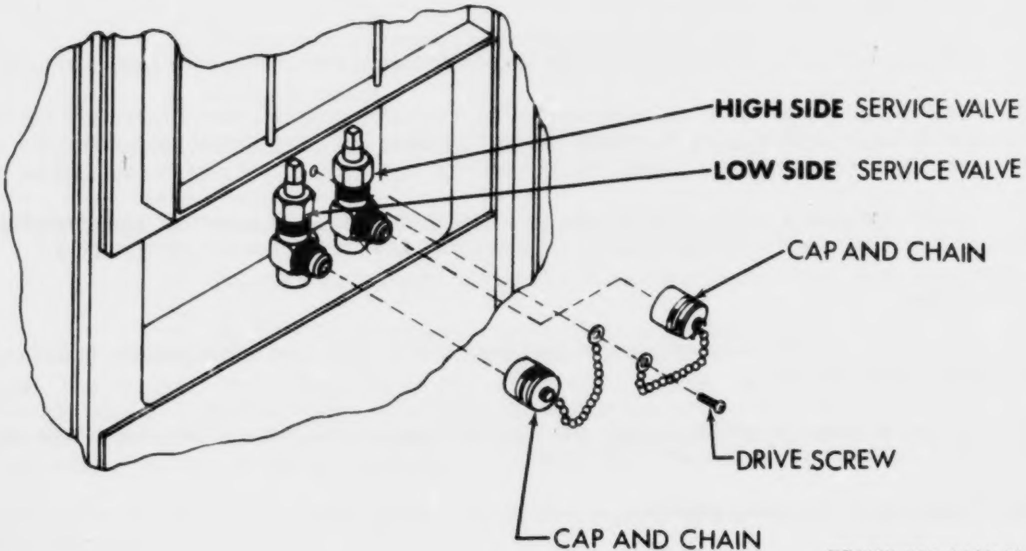


Figure 4-71. Service Valves and Caps and Chains

b. Removal of cap and chain

(1) Using pliers remove drive screw. This screw retains both chains.

(2) Unscrew and remove cap(s) from service valve.

c. Installation

(1) Screw cap(s) in place on service valve(s).

(2) Using hammer and punch, secure both chains to air conditioner housing with drive screw.

4-68. SERVICE VALVES

Preliminary Procedures: 1. Disconnect power.

2. Remove right end condenser cover. (See paragraph 3-26.)

3. Remove condenser section electrical module assembly. (See paragraph 4-90.)

a. Removal (Applies to HIGH SIDE and LOW SIDE service valves.)

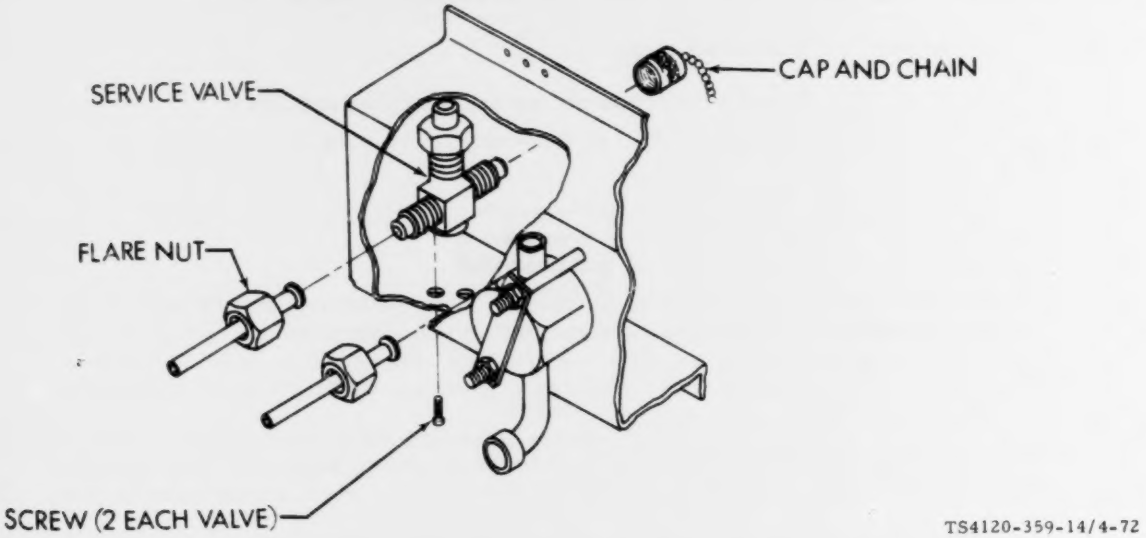


Figure 4-72. LOW SIDE and HIGH SIDE Service Valves

(1) Discharge the refrigerant system. (See paragraph 4-5.)

(2) Check that cap is loose from valve.

(3) Using wrench, disconnect the flare nut from the back of the valve.

(4) Using screwdriver, remove two screws that hold valve to condenser housing.

(5) Remove valve.

b. Installation

(1) Place service valve on condenser housing and aline screw holes.

(2) Apply locking compound, item 15, Appendix E, to screw threads.

(3) Using screwdriver, install service valve with two screws.

(4) Using wrench connect and tighten flare nut to back of valve.

(5) Replace the dehydrator. (See paragraph 4-73.)

(6) Leak test the newly connected joints and all connections in those areas. (See paragraph 4-8.)

(7) Evacuate and charge the system. (See paragraphs 4-9 and 4-10.)

Follow-on Procedures:
1. Install right end condenser cover. (See paragraph 3-26.)
2. Install condenser section electrical module assembly. (See paragraph 4-90.)
3. Connect power.

4-69. SOLENOID VALVES (L1 AND L2) TEST AND COIL REPLACEMENT

Preliminary Procedures:
1. Disconnect power.
2. Remove top condenser cover. (See paragraph 3-25.)

a. Test

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

NOTE

The following basic instructions apply to both the equalizing solenoid L1 and the liquid line solenoid L2.

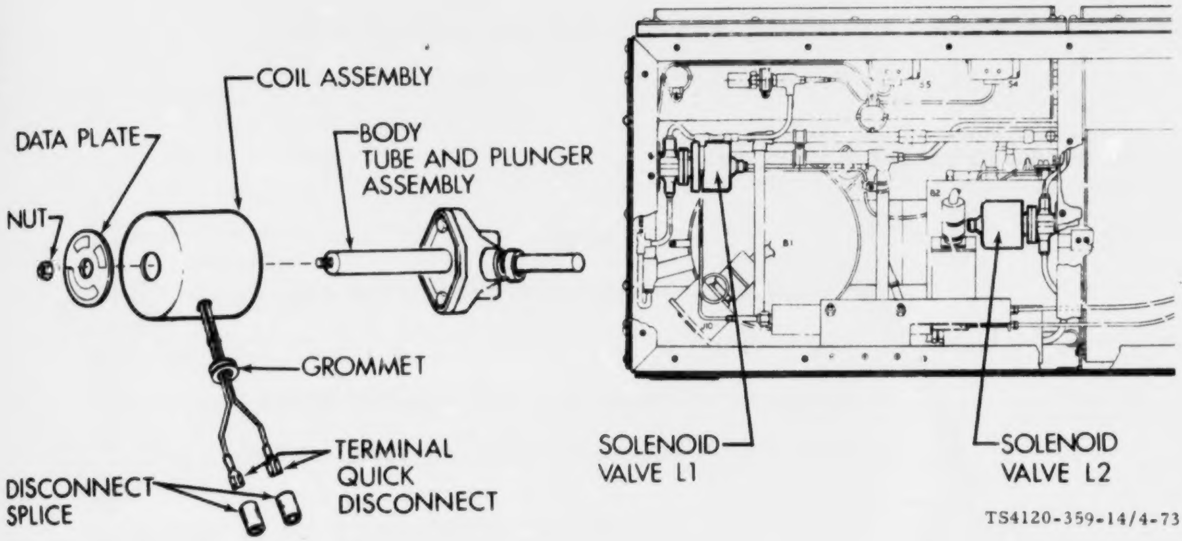
(1) Disconnect the solenoid valve leads at the quick disconnect terminals.

(2) Use multimeter set on the lowest ohms scale to check for resistance between leads. If resistance is not between 40 and 70 ohms, the coil is bad and must be replaced.

(3) Use multimeter to check for continuity between each lead and the coil casing. If continuity is found between either lead and the case, the coil is grounded and should be replaced.

(4) If resistance checks are satisfactory, apply 24 volts dc from an external power supply across the leads and listen for a sharp click when the valve changes position. If a click is not heard, internal valve problems are indicated and the entire valve should be replaced. See paragraph 4-70 for complete valve replacement.

b Coil replacement. The coil can be replaced without opening the refrigeration pressure system.



TS4120-359-14/4-73

Figure 4-73. Solenoid Valve Coil Removal

WARNING

Do not attempt any disassembly of the solenoid valve other than coil removal with a refrigerant charge in the system. Refrigerant will be sprayed out dangerously if the screws that attach the tube and plunger assembly to the valve body are loosened.

(1) Disconnect the two leads at the disconnect splices.

(2) Using wrench, remove the top nut that attaches the coil to the valve body.

(3) Lift the coil assembly and data plate from the body tube and plunger assembly.

(4) If the grommet is to be reused, remove it from the coil assembly.

c. Installation of replacement coil

(1) Remove and discard grommet supplied with coil.

(2) Install replacement grommet.

(3) Cut solenoid valve coil leads to 6.00 ± 0.25 inches (15.24 ± 0.63 cm) long.

(4) Install quick disconnect terminal lugs on end of both leads.

(5) Slip the coil assembly and data plate on to the body tube and plunger assembly.

(6) Using wrench, secure the coil with a nut.

(7) Connect leads to disconnect splices.

Follow-on Procedures:
1. Install top condenser cover. (See paragraph 3-25.)
2. Connect power.

4-70. SOLENOID VALVES (L1 AND L2)

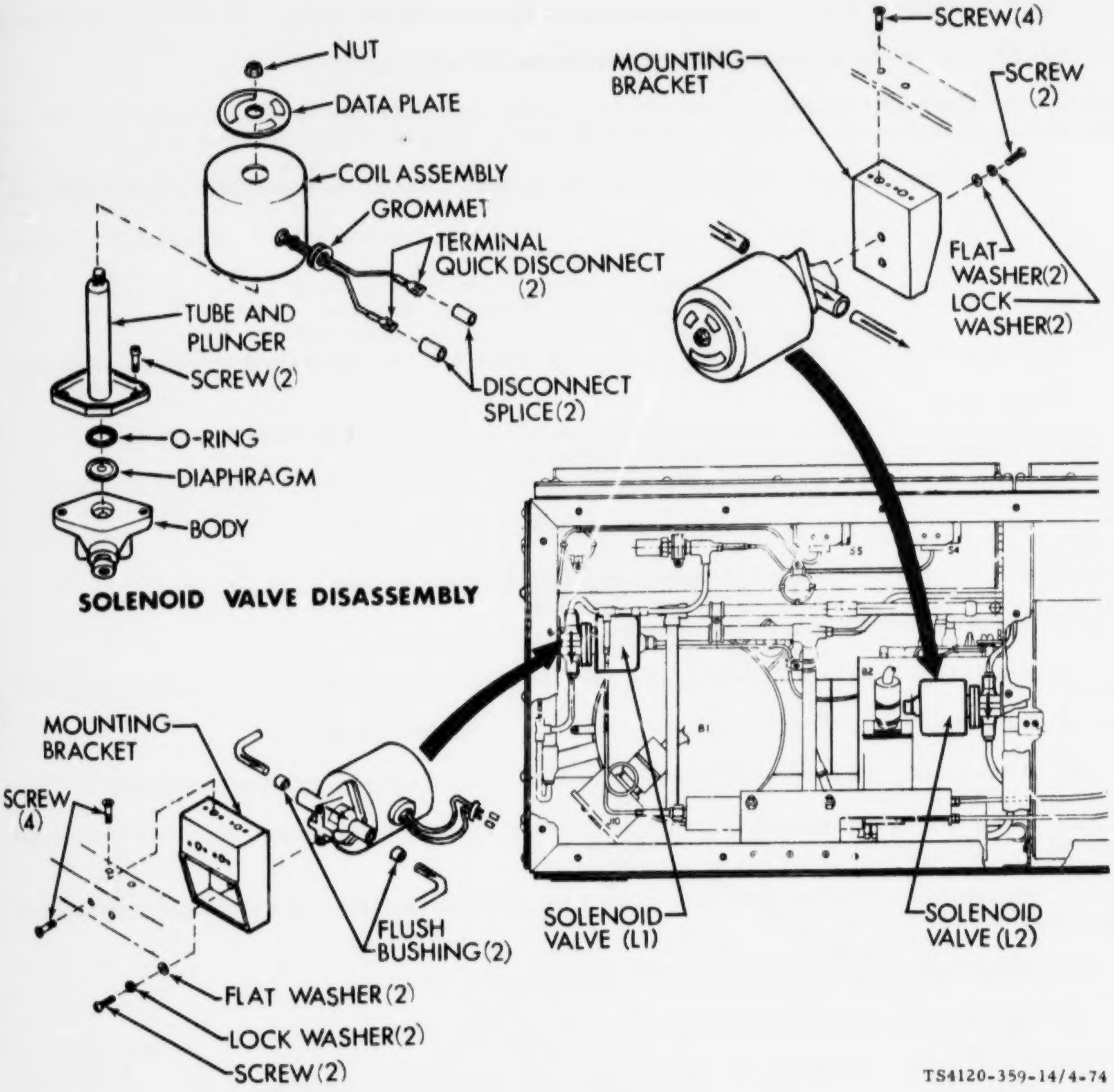
NOTE

For testing and coil replacement, see paragraph 4-69.

Preliminary Procedures:
1. Disconnect power.
2. Remove top condenser cover. (See paragraph 3-25.)
3. Remove left end condenser cover. (See paragraph 3-27.)

NOTE

If only the coil is bad, it can be replaced without breaking into the refrigerant system. See paragraph 4-69.



TS4120-359-14/4-74

Figure 4-74. Solenoid Valves (L1 and L2)

a. Removal

(1) Discharge and purge the refrigeration system per paragraphs 4-5 and 4-6.

(2) Disconnect the two leads at the disconnect splices.

(3) Using wrench, remove the top nut that attaches the coil to the valve body.

(4) Lift the coil assembly and data plate from the body tube and plunger assembly.

(5) If the grommet is to be reused, remove it from the coil assembly.

(6) Be sure that the refrigerant has been discharged.

(7) Remove the two screws that attach the tube and plunger assembly to the valve body, remove the tube and plunger assembly, and then all other removable internal components from the valve body.

(8) While purging system with nitrogen, debraze the tubing from the body. See paragraphs 4-6 and 4-7.

NOTE

Note the arrow direction of flow on valve body.

(9) Using screwdriver, remove two screws, lock washers, and flat washers and remove the valve body.

b. Installation

(1) Disassemble all removable components from the new valve.

NOTE

Step (2) applies only to the L1 solenoid valve.

(2) Install the flush bushings in the valve body.

(3) Position the valve body in the unit. See arrow on valve body and figure 4-74 for proper installation.

(4) Purge system with nitrogen and braze joints. See paragraphs 4-6 and 4-7.

(5) Apply locking compound, item 15, Appendix E, to solenoid valve mounting screw threads.

(6) Using screwdriver, secure valve body to mounting bracket with two screws, lock washers, and flat washers.

(7) Reassemble the internal components in the valve body and install the tube and plunger assembly, and two attaching screws.

(8) Remove and discard grommet supplied with coil.

(9) Install replacement grommet in coil.

(10) Cut solenoid valve coil leads to 6.00 ± 0.25 inches (15.24 ± 0.63 cm) long.

(11) Install quick disconnect terminal lugs on ends of both leads.

(12) Slip the coil assembly and data plate onto the body tube and plunger assembly.

(13) Using wrench, secure the coil with a nut.

(14) Connect leads to disconnect splices.

(15) Replace the dehydrator. (See paragraph 4-73.)

(16) Leak test all newly connected joints and all tube connections in the area. (See paragraph 4-8.)

(17) Evacuate and charge the refrigerant system in accordance with paragraphs 4-9 and 4-10.

Follow-on Procedures:
1. Install left end condenser cover. (See paragraph 3-27.)
2. Install top condenser cover. (See paragraph 3-25.)
3. Connect power.

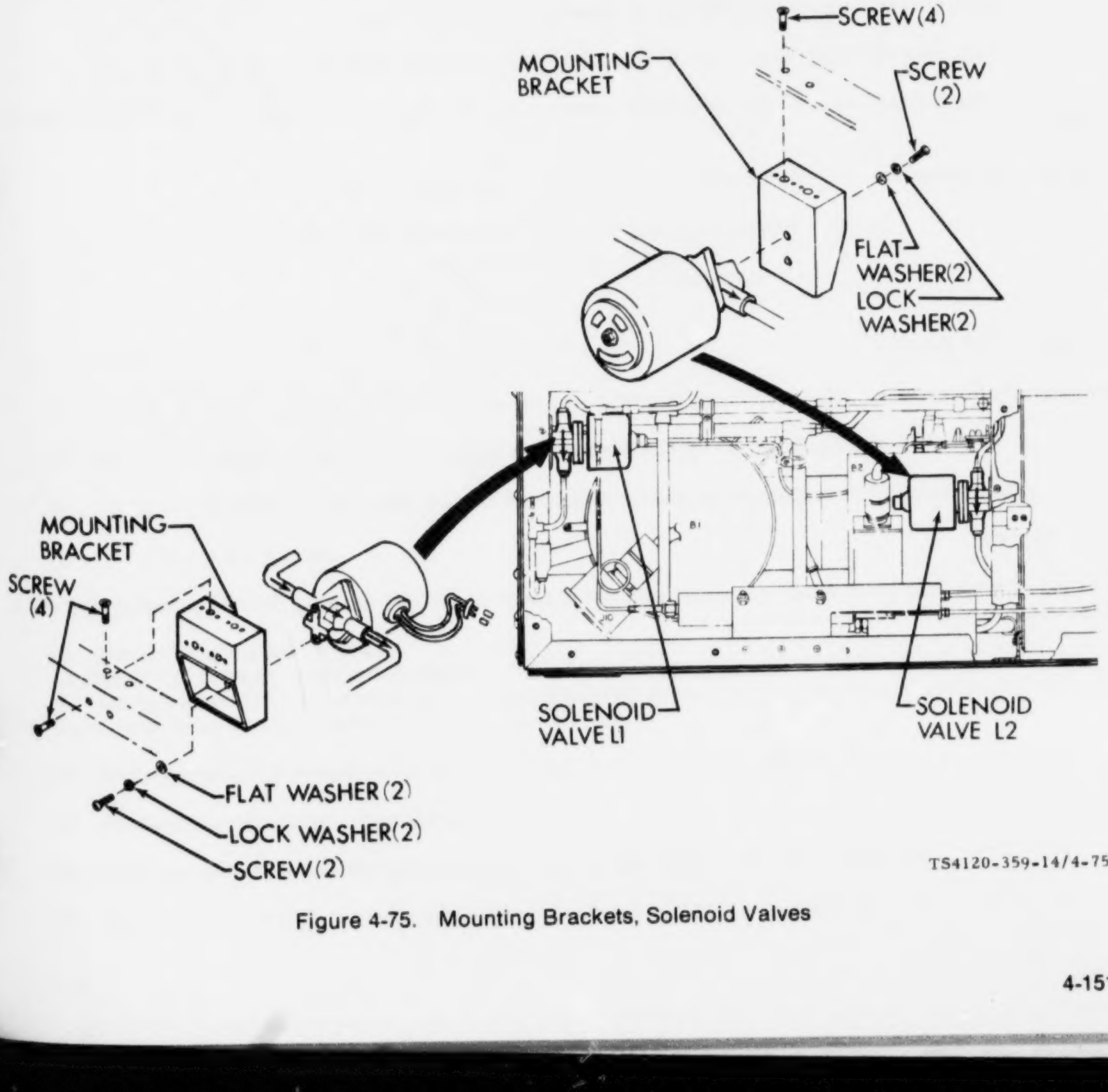
4-71. MOUNTING BRACKETS, SOLENOID VALVES

Preliminary Procedures:
1. Disconnect power.
2. Remove condenser top cover. (See paragraph 3-25.)
3. Remove left end condenser cover. (See paragraph 3-27.)

a. Inspect

(1) Check that brackets are not cracked, bent, broken, or badly dented, Replace if damaged.

(2) Check that plate nuts are in place and secure. Replace them if they are loose or damaged.



TS4120-359-14/4-75

Figure 4-75. Mounting Brackets, Solenoid Valves

b. Removal

(1) Using screwdriver, remove two screws, lock washers, and flat washers that attach solenoid valve.

(2) Using screwdriver, remove four screws that attach bracket to housing.

(3) Slip bracket out of air conditioner.

c. Repair

(1) Repairs are limited to replacement of rivets and plate nuts.

(2) Plate nuts may be removed by drilling out the old rivet using a drill bit slightly smaller than the diameter of the rivet.

(3) Install new plate nut(s) and rivets.

d. Installation

(1) Position bracket in unit and aline holes.

(2) Using screwdriver, secure bracket to housing with four screws.

(3) Apply locking compound, item 15, Appendix E, to solenoid valve mounting screw threads.

(4) Using screwdriver, secure the solenoid valve to the bracket with two screws, lock washers, and flat washers.

Follow-on Procedures:
1. Install left end condenser cover. (See paragraph 3-27.)
2. Install condenser top cover. (See paragraph 3-25.)
3. Connect power.

4-72. SIGHT GLASS

Preliminary Procedures:
1. Disconnect power.
2. Remove right end condenser cover. (See paragraph 3-26.)
3. Remove condenser electrical module. (See paragraph 4-90.)

a. Inspect

(1) Check that glass window is clean and not cracked or broken. Clean if dirty. Replace sight glass if cracked or broken.

(2) Check for evidence of leakage. Leak test if leak is suspected. Repair or replace as indicated.

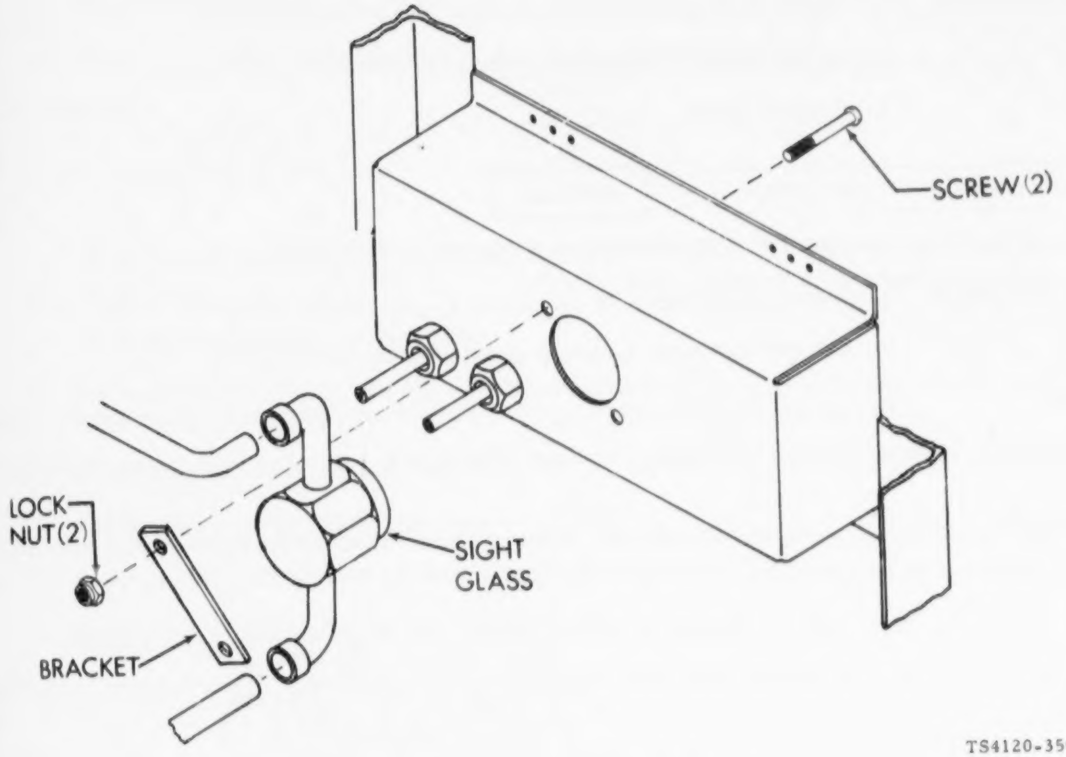


Figure 4-76. Sight Glass

b. Removal

(1) Discharge the refrigerant system per paragraph 4-5.

(2) While purging the system with nitrogen, debraze the tubing. (See paragraphs 4-6 and 4-7.)

(3) Using a screwdriver and wrench, remove two screws and lock nuts and sight glass bracket.

(4) Remove the sight glass.

c. Installation

(1) Position sight glass in unit.

(2) Using screwdriver and wrench, secure sight glass with bracket and two screws and lock nuts. Be sure that sight glass is centered on opening in housing.

(3) While purging the system with nitrogen, braze the tubing joints. (See paragraphs 4-6 and 4-7.)

(4) Replace the dehydrator. (See paragraph 4-73)

(5) Leak test all newly connected joints and those in the repair area. (See paragraph 4-8.)

(6) Evacuate and charge the refrigerant system. (See paragraphs 4-9 and 4-10.)

Follow-on Procedures:
1. Install condenser electrical module. (See paragraph 4-90.)
2. Install right end condenser cover. (See paragraph 3-26.)
3. Connect power.

4-73. DEHYDRATOR (FILTER DRIER)

Replace the dehydrator whenever the refrigerant system is opened for any reason.

Preliminary Procedures:
1. Disconnect power.
2. Remove right end condenser cover. (See paragraph 3-26.)

a. Inspect

(1) Check for general condition and signs of leakage. If leakage is suspected, leak test per paragraph 4-8.

(2) Check that clamps are in place and secure. Tighten clamps if they are loose. Replace if missing.

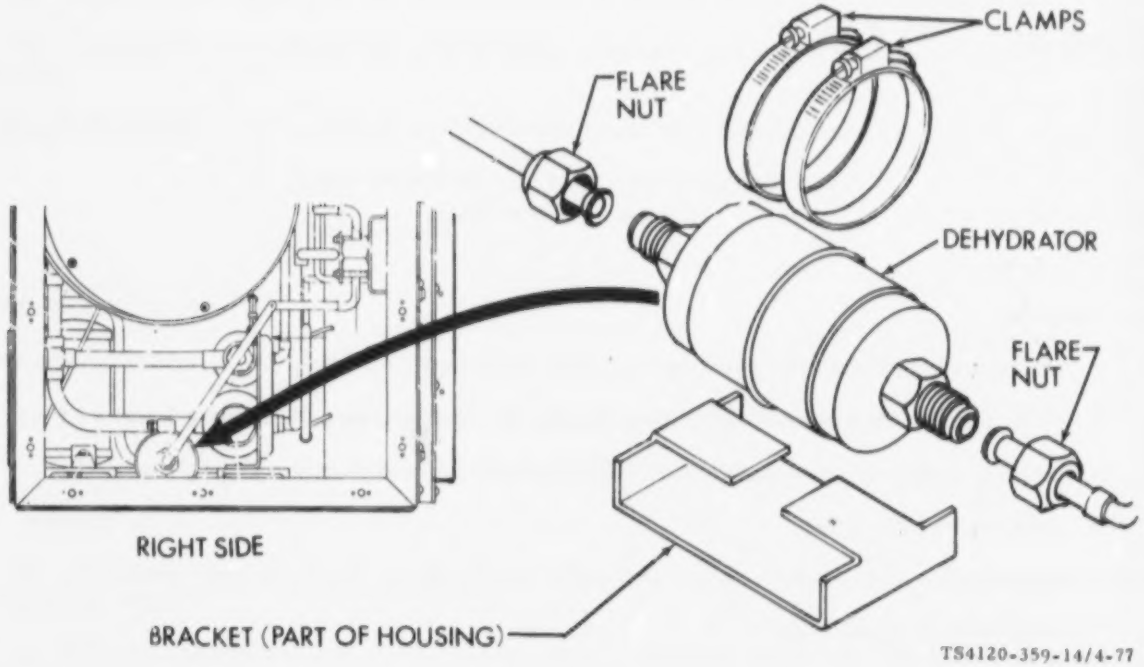


Figure 4-77. Dehydrator

b. Remove

(1) Discharge the refrigerant system per paragraph 4-5.

(2) Using wrench, loosen and disconnect flare nuts.

(3) Using screwdriver, remove two clamps.

(4) Remove dehydrator. Note direction of flow arrow for installation.

c. Installation

CAUTION

Replacement dehydrators are packaged with sealing caps on the flare fittings, to prevent moisture contamination of the desiccant filtering media. Remove these caps immediately prior to installation. Never install a dehydrator from which caps have been removed for an extended or unknown period of time.

(1) Place dehydrator in unit and slip two clamps around dehydrator and tabs that are part of bracket welded to bottom of housing. Be sure flow arrow is pointing away from compressor.

(2) Using screwdriver, tighten clamps.

(3) Using wrench tighten both flare nuts.

(4) Leak test all newly connected joints and those in the repair area. (See paragraph 4-8.)

(5) Evacuate and charge the refrigerant system. (See paragraphs 4-9 and 4-10.)

Follow-on Procedures: 1. Install right end condenser cover. (See paragraph 3-26.)

2. Connect power.

4-74. RECEIVER, LIQUID REFRIGERANT

Preliminary Procedures: 1. Remove air conditioner from shelter. (See paragraph 3-6.)

2. Separate evaporator and condenser section assemblies. (See paragraph 4-14.)

3. Remove front condenser cover. (See paragraph 3-23.)

a. Inspect

(1) Check for general condition and signs of leakage. If leakage is suspected, leak test per paragraph 4-8.

(2) Check that mounting nut is secure.

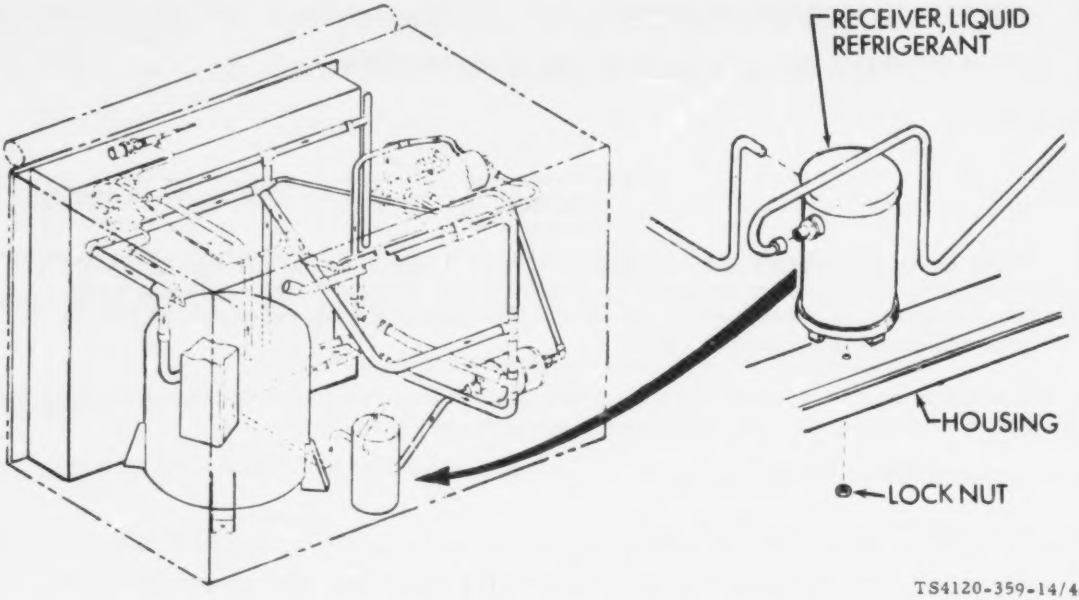


Figure 4-78. Receiver, Liquid Refrigerant

b. Removal

(1) Discharge the refrigerant system per paragraph 4-5.

(2) While purging the system with nitrogen, debraze the tubing. (See paragraphs 4-6 and 4-7.)

(3) Using wrecker or similar hoisting device, lift the condenser section assembly high enough to gain access to receiver lock nut. Place unit on blocks or boards so that easy access to lock nut can be achieved.

(4) Using socket and ratchet, remove lock nut that attaches the receiver from the recessed hole in the bottom of condenser housing.

(5) Remove receiver from condenser housing.

c. Installation

(1) Position receiver in condenser housing so that bottom stud is inserted through mounting hole in bottom condenser housing channel.

(2) Aline tubing connections.

(3) Using socket and ratchet, secure receiver to bottom condenser housing channel. Lock nut must be inserted through recessed hole from bottom of condenser housing.

(4) While purging the system with nitrogen, braze the tubing joints. (See paragraphs 4-6 and 4-7.)

(5) Replace the dehydrator. (See paragraph 4-73.)

(6) Leak test all newly connected joints and those in the repair area. (See paragraph 4-8.)

(7) Using wrecker or similar hoisting device, lift the condenser section from supports that were used to gain access to receiver mounting lock nut.

(8) Install front condenser cover. (See paragraph 3-23.)

(9) Connect evaporator and condenser section assemblies. (See paragraph 4-14.)

(10) Evacuate and charge the refrigerant system. (See paragraphs 4-9 and 4-10.)

Follow-on Procedure: Install air conditioner on shelter. (See paragraph 3-6.)

4-75. ACTUATING CYLINDER

Preliminary Procedures: 1. Disconnect power.

2. Remove top condenser cover. (See paragraph 3-25.)

a. Inspect

(1) Check actuating cylinder for signs of leakage. If leakage is suspected, leak test per paragraph 4-8.

(2) Check that mounting nuts and push-pull cable attachment hardware are in place and secure. Replace if missing. Tighten if loose.

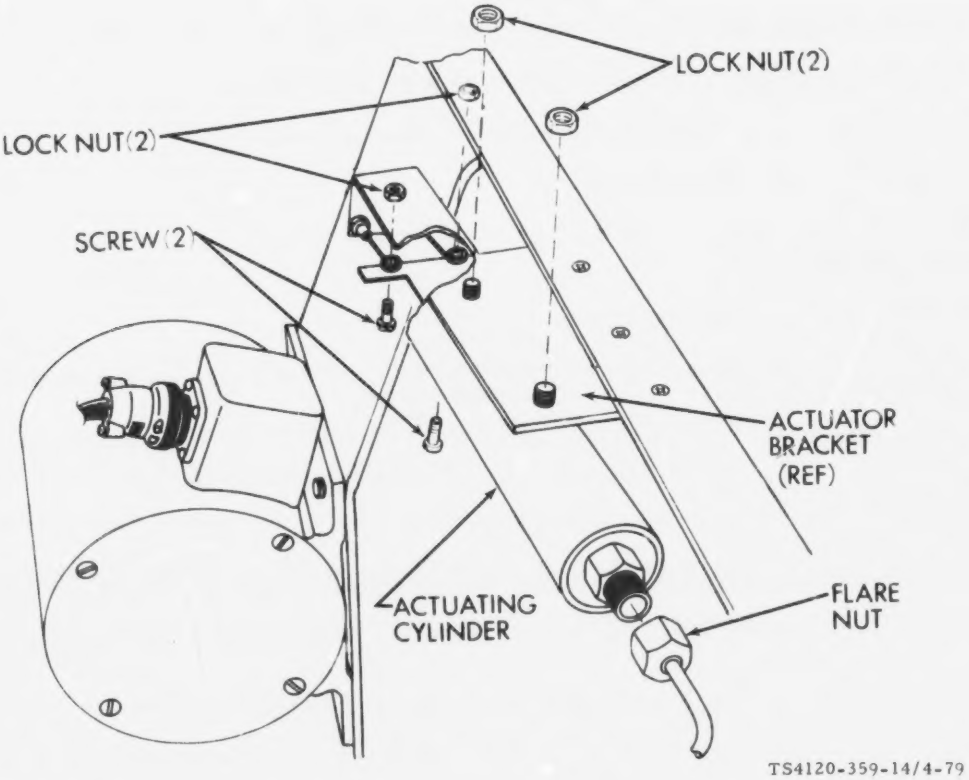


Figure 4-79. Actuating Cylinder

b. Removal

(1) Discharge the refrigerant system per paragraph 4-5.

(2) Using screwdriver and wrench, remove two screws and lock nuts that hold push-pull control cables.

(3) Using wrench, loosen and disconnect flare nut.

(4) Using wrench, remove two lock nuts that secure cylinder to bracket.

(5) Remove actuating cylinder.

b. Installation

(1) Position cylinder and insert mounting studs through bracket.

(2) Using wrench, secure cylinder to bracket with two lock nuts.

(3) Using wrench, connect and tighten flare nut.

(4) Using screwdriver and wrench, secure the two push-pull control wire ends to the actuator rod with two screws and lock nuts.

(5) Replace the dehydrator. (See paragraph 4-73.)

(6) Leak test all newly connected joints and those in the repair area. (See paragraph 4-8.)

(7) Evacuate and charge the refrigerant system. (See paragraphs 4-9 and 4-10.)

Follow-on Procedures:
1. Install top condenser cover. (See paragraph 3-25.)
2. Connect power.

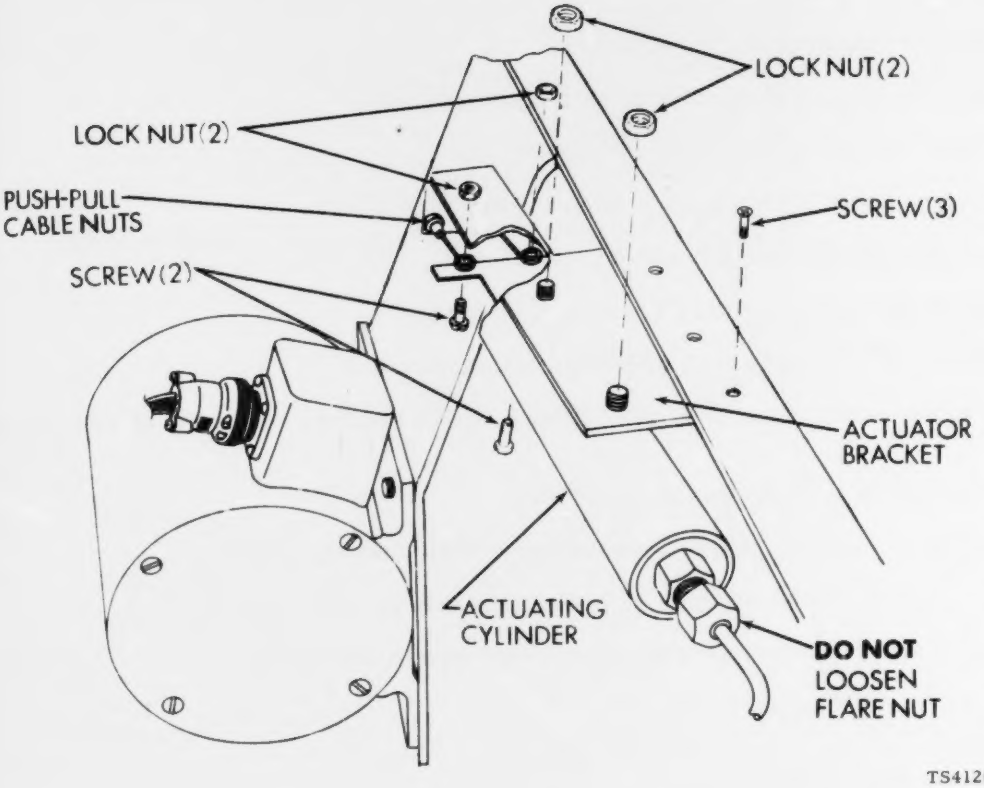
4-76. ACTUATOR BRACKET

Preliminary Procedures:
1. Disconnect power.
2. Remove air conditioner from shelter (if required). (See paragraph 3-6.)
3. Remove top condenser cover. (See paragraph 3-25.)
4. Remove right end condenser cover. (See paragraph 3-26.)

a. Inspect

(1) Check that bracket is not cracked, broken, bent, or otherwise damaged. Replace if damaged.

(2) Check that plate nuts are not loose, broken, or missing. Replace them if they are missing or broken.



TS4120-359-14/4-80

Figure 4-80. Actuator Bracket

b. Removal

WARNING

Do not loosen flare nut. If the flare nut is loosened when the system is charged, liquid refrigerant will be sprayed out dangerously.

(1) Using screwdriver and wrench, remove two screws and lock nuts that hold push-pull control cables.

(2) Using wrench, remove two lock nuts that secure cylinder to bracket.

(3) Taking care that tubing is not kinked, move actuator cylinder out of the way. Tie or support it so that it will not be damaged.

(4) Using screwdriver, loosen mechanical post screws. (See figure 4-58.)

(5) Pull control wires out of push-pull controls.

(6) Using wrench, remove the nuts from the end of the two push-pull control cables.

(7) Using screwdriver, remove the three screws that attach the actuator bracket to housing.

(8) Remove actuator bracket.

c. Installation

(1) Place actuator bracket in unit and aline holes.

(2) Using screwdriver, secure bracket to housing with three screws.

(3) Slip push-pull control cables through the two end holes.

(4) Using wrench, secure the two push-pull control cables with nuts.

(5) Insert control wires into push-pull controls.

(6) Position cylinder and insert mounting studs through bracket.

(7) Using wrench, secure cylinder to bracket with two lock nuts.

(8) Using screwdriver and wrench, secure the two push-pull control wire ends to the actuator rod with two screws and lock nuts.

(9) See paragraph 4-60.d for outlet vane adjustment.

Follow-on Procedures:

1 Install the top condenser cover. (See paragraph 3-25.)

2. Install right end condenser cover. (See paragraph 3-26.)

3. Install air conditioner on shelter. (See paragraph 3-6.)

4. Connect power.

4-77. EXPANSION VALVE (QUENCH)

Preliminary Procedures:

1. Disconnect power.

2. Remove air conditioner from shelter. (See paragraph 3-6.)

3. Remove right end condenser cover. (See paragraph 3-26.)

4. Remove left end condenser cover. (See paragraph 3-27.)

a. Inspect

(1) Inspect for evidence of leaks, kinked, or otherwise damaged capillary line, and loose or missing valve stem cap.

(2) Check sensing bulb to see that it is securely clamped to the compressor inlet suction line.

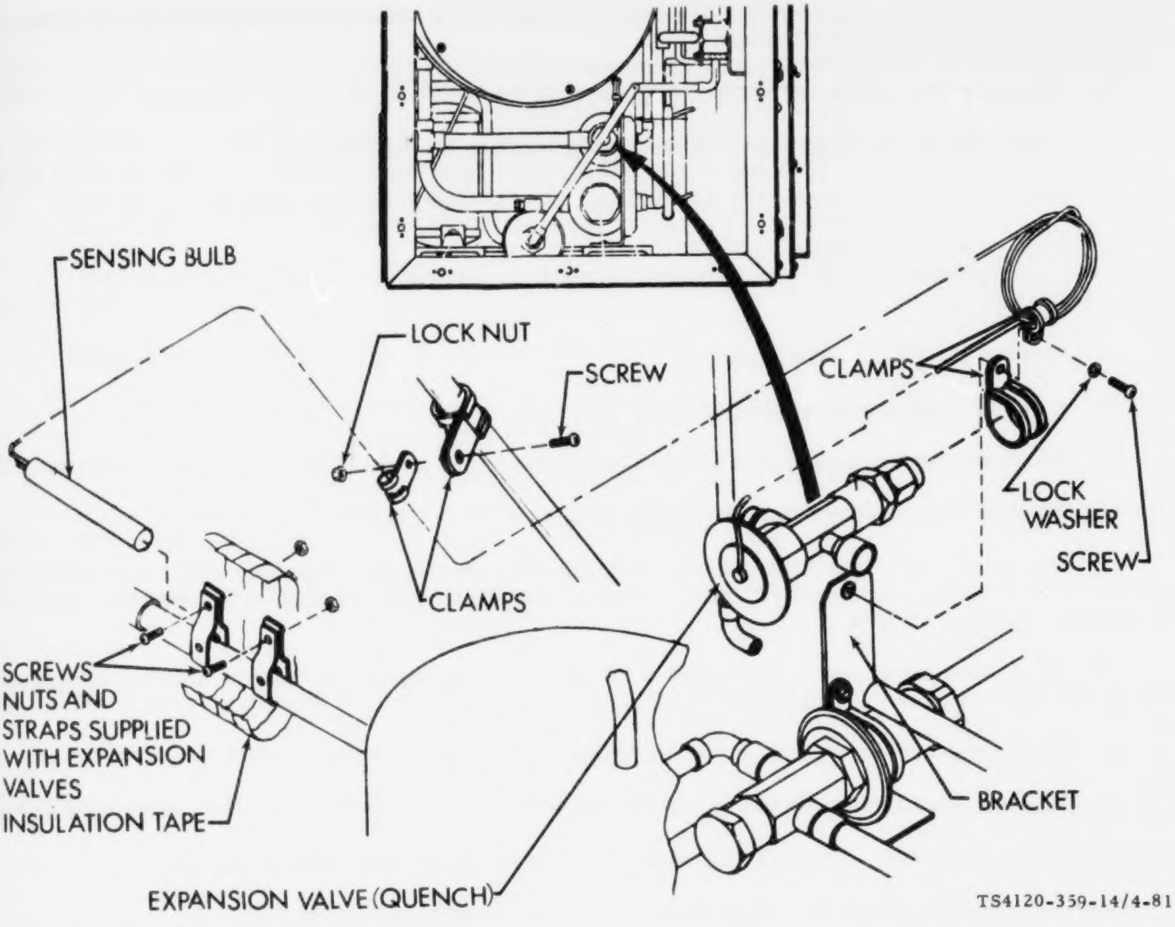


Figure 4-81. Expansion Valve (Quench)

(3) If a leak is suspected or indicated, test per paragraph 4-8.

b. Adjustment

(1) The liquid quench expansion valve is factory set at a superheat of 35° ± 1/2°F (1.6° ± 0.3°C) at a 32°F (0°C) bath temperature.

(2) Due to possible compressor damage, field adjustment of installed quench valve is not recommended.

c. Removal

(1) Remove insulation from compressor inlet tube to expose sensing bulb and straps.

(2) Using screwdriver and wrench, loosen two screws, nuts, and straps that retain sensing bulb.

(3) Slip the bulb from straps.

(4) Using screwdriver and wrench, remove the screw, lock nut, and clamp holding sensing bulb capillary tube to refrigeration piping.

(5) Using screwdriver and wrench, remove the screw, lock washer and clamps that secure expansion valve and coiled capillary to the bracket.

(6) Discharge the refrigerant system per paragraph 4-5.

(7) Wrap wet rags around expansion valve body, if it is to be reinstalled.

(8) While purging the system with nitrogen, debraze the tubing. (See paragraphs 4-6 and 4-7.)

(9) Remove expansion valve from unit.

d. Installation

(1) Position expansion valve in unit.

(2) Wrap wet rags around expansion valve body.

(3) While purging the system with nitrogen, braze the tubing joints. (See paragraphs 4-6 and 4-7.)

(4) Replace the dehydrator. (See paragraph 4-73.)

(5) Slip sensing bulb into its mounting bulb straps. Be sure bulb is centered on top of compressor inlet suction line and tighten two nuts and screws. Be sure sensing bulb is making good metal-to-metal contact with compressor inlet suction line.

(6) Using screwdriver and wrench, secure the capillary line from the sensing bulb to the refrigeration piping with a screw, locknut, and clamps.

(7) Coil excess capillary tubing above expansion valve.

(8) Secure excess capillary tubing and expansion valve to bracket with screw, lock washer, and clamps.

(9) Leak test all newly connected joints and those in the repair area. (See paragraph 4-8.)

(10) Evacuate and charge the refrigerant system. (See paragraphs 4-9 and 4-10.)

(11) Replace the insulation tape that was removed from the sensing bulb and expansion valve connections. Use insulation tape, item 14, Appendix E. Apply in spiral with overlapping edges.

Follow-on Procedures:
1. Install left end condenser cover. (See paragraph 3-27.)
2. Install right end condenser cover. (See paragraph 3-26.)
3. Install air conditioner on shelter. (See paragraph 3-6)
4. Connect power.

4-78. DISCHARGE BYPASS VALVE

Preliminary Procedure: 1. Remove condenser section electrical module assembly. (See paragraph 4-90.)

a. Adjustment/Test

(1) Valves are factory set to start opening when suction pressure decreases to 58 psig. Do not adjust unless you are sure adjustment is necessary.

(2) Using screwdriver, remove eight screws from condenser section electrical module assembly.

(3) Pull module out and to side. Do not disconnect P12 and P13 connectors.

(4) Operate air conditioner in COOL mode with temperature control in maximum WARMER position and pressure gage connected to LOW SIDE service valve (compressor suction).

(5) Bypass valve should open when LOW SIDE pressure drops to between 52 and 60 psig. ADJUSTMENT is required if bypass valve does not open when LOW SIDE pressure is 52 to 60 psig.

(6) To adjust, use hand to remove cap (10) covering adjusting screw in bypass valve.

(7) Use 5/16 inch Allen wrench to turn adjusting screw to raise or lower bypass valve opening pressure. Adjust slowly.

(8) Replace cap.

(9) Turn off air conditioner and disconnect power.

b. Inspect

(1) Inspect for evidence of leaks and external damage. If a leak is indicated, leak test per paragraph 4-8. Replace valve if damaged.

(2) Check that valve cap is in place.

c. Removal

(1) Remove air conditioner from shelter if necessary. (See paragraph 3-6.)

(2) Remove right end condenser cover. (See paragraph 3-26.)

(3) Disconnect P12 and P13 connectors and remove condenser section electrical module assembly.

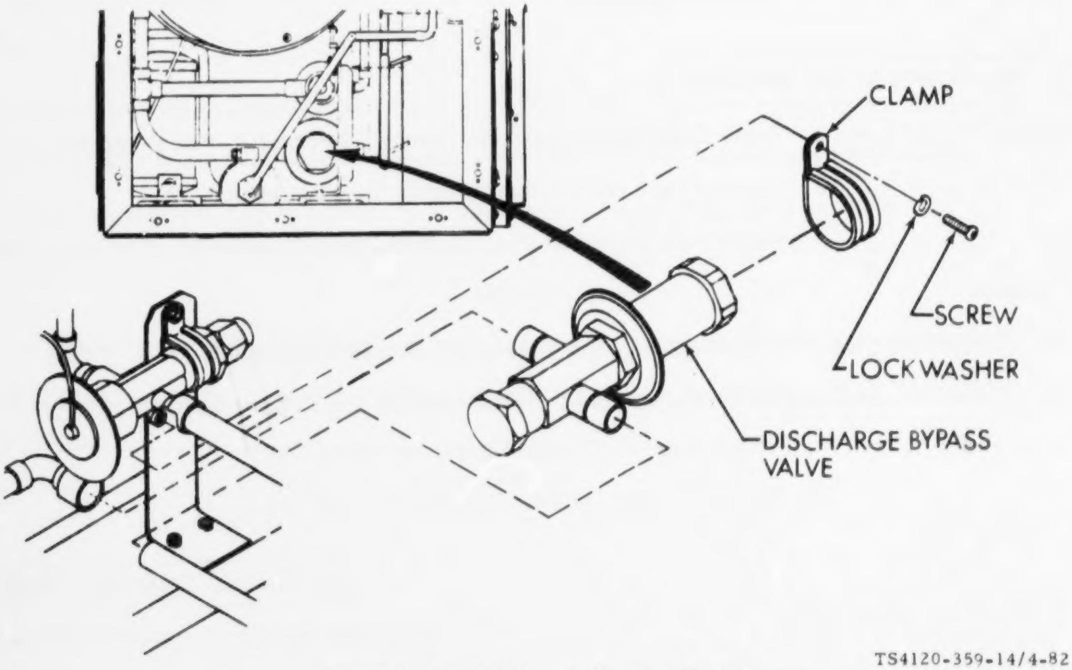


Figure 4-82. Discharge Bypass Valve

(4) Using a screwdriver, remove screw, lock washer, and clamp that holds valve to bracket.

(5) Discharge the refrigerant system per paragraph 4-5.

(6) Wrap wet rags around valve body if it is to be reinstalled.

(7) While purging the system with nitrogen, debraze the tubing. (See paragraphs 4-6 and 4-7.)

(8) Remove discharge bypass valve from unit.

d. Installation

(1) Position discharge bypass valve in unit.

(2) Wrap wet rags around valve body.

(3) While purging the system with nitrogen, braze the tubing joints. (See paragraphs 4-6 and 4-7.)

(4) Using screwdriver, secure valve to bracket with a screw, lock washer, and clamp.

(5) Replace the dehydrator. (See paragraph 4-73.)

(6) Leak test all newly connected joints and those in the repair area. (See paragraph 4-8.)

(7) Evacuate and charge the refrigerant system. (See paragraphs 4-9 and 4-10.)

Follow-on Procedures:
1. Install right end condenser cover. (See paragraph 3-26.)
2. Install condenser section electrical module assembly. (See paragraph 4-90.)
3. Install air conditioner on shelter. (See paragraph 3-6.)
4. Connect power.

4-79. VALVE MOUNTING BRACKET

Preliminary Procedures:
1. Remove air conditioner from shelter, if necessary. (See paragraph 3-6.)
2. Remove right end condenser cover. (See paragraph 3-26.)
3. Remove condenser section electrical module assembly. (See paragraph 4-90.)

a. Inspect

(1) Check that bracket is not cracked, bent, or broken. Replace if damaged.

(2) Check that mounting hardware and blind nuts are secure and in good condition.

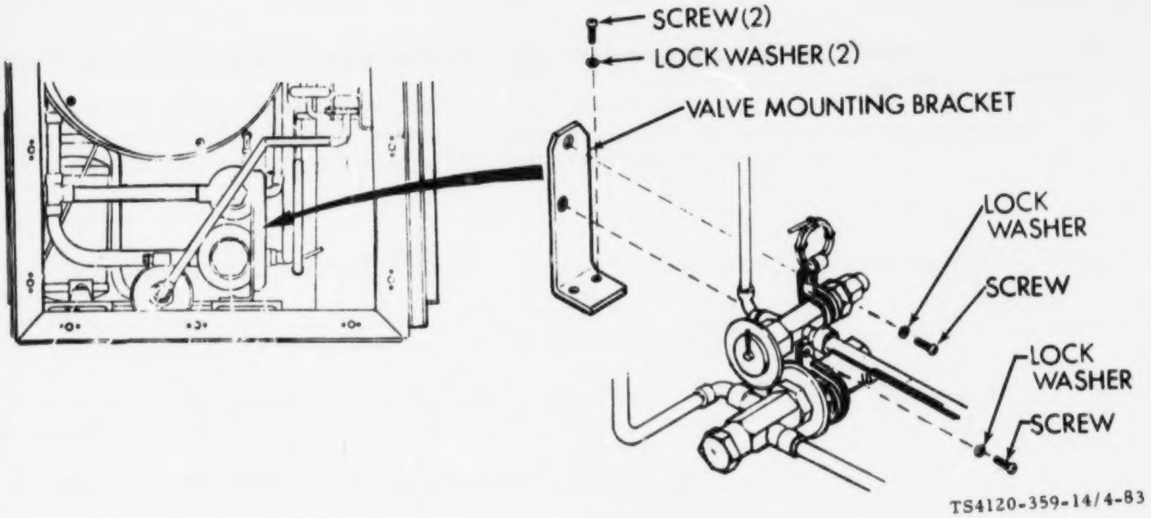


Figure 4-83. Valve Mounting Bracket

b. Removal

(1) Using screwdriver, remove two screws and lock washers from the valve and capillary clamps.

(2) Using offset screwdriver, remove two screws from the base of bracket.

(3) Remove bracket from unit.

c. Installation

(1) Position bracket in unit and aline base mounting holes.

(2) Using offset screwdriver, secure bracket to housing with two screws and lock washers.

(3) Using screwdriver, secure clamps to bracket with two screws and lock washers.

NOTE

Upper screw and lock washer secures both capillary and expansion valve clamps.

Follow-on Procedures:
1. Install right end condenser cover. (See paragraph 3-26.)
2. Install condenser section electrical module assembly. (See paragraph 4-90.)
3. Install air conditioner on shelter. (See paragraph 3-6.)

4-80. HIGH PRESSURE SWITCH (S4)

Preliminary Procedures:
1. Disconnect power.
2. Remove top condenser cover. (See paragraph 3-25.)

a. Inspect

(1) Check that mounting screws and terminal attachment screws are in place and secure. Tighten if loose. Replace if missing.

(2) Check that capillary line is not kinked, mashed, or broken. Replace switch if capillary line is damaged.

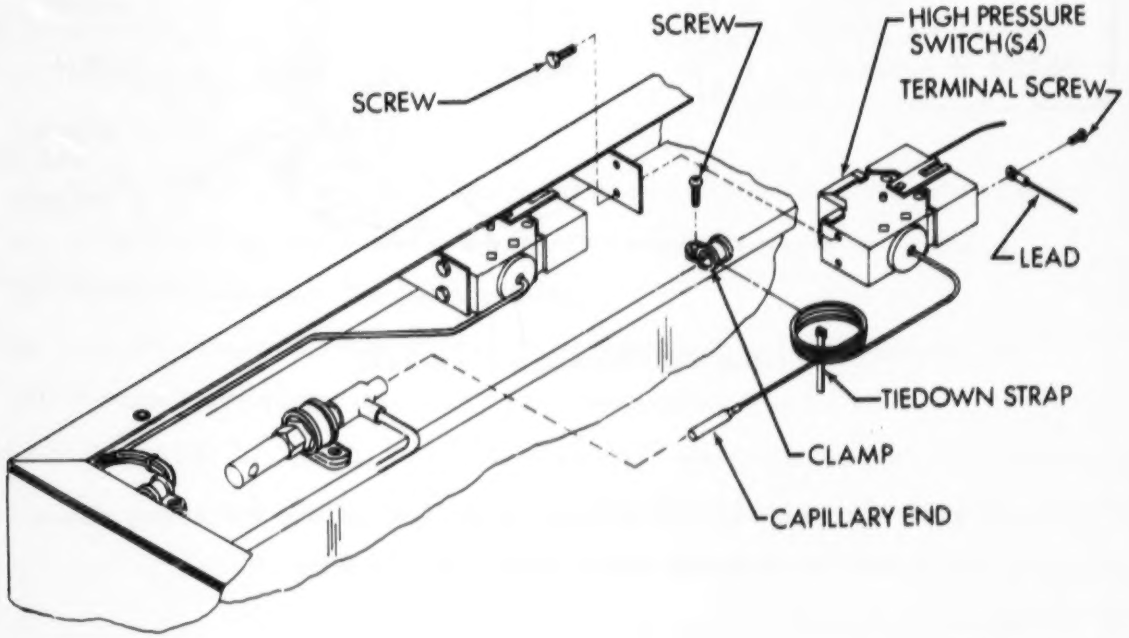


Figure 4-84. High Pressure Switch (S4)

b. Test. Press and release reset button on switch. Use a continuity tester or multimeter to check for continuity between terminals 1 and 2 on switch. If there is continuity, the switch is properly closed. If no continuity is found, press and release reset button again. If there is still no continuity, switch must be replaced.

c. Removal

(1) Discharge the refrigerant system per paragraph 4-5.

(2) While purging the system with nitrogen, debraze the capillary end from the tube tee. (See paragraphs 4-6 and 4-7.)

(3) Using a screwdriver, remove the screw and clamp from the coil of capillary tubing.

(4) Tag and disconnect the two leads.

(5) Using an offset screwdriver or wrench, remove two screws holding the pressure switch.

(6) Remove the pressure switch.

d. Installation

(1) Position pressure switch on bracket and aline holes.

(2) Using an offset screwdriver or wrench, secure the pressure switch to bracket with two screws.

(3) See tags, wire marking, and wiring diagram figure 4-3 and connect leads.

(4) Remove tags.

(5) Carefully form and position capillary tubing. Coil excess capillary tubing in three loops located at clamp attachment point.

(6) While purging the system with nitrogen, braze the capillary end into the tube tee.

(7) Using screwdriver, secure the capillary loops with a screw and clamp and three equally spaced tiedown straps.

(8) Replace the dehydrator. (See paragraph 4-73.)

(9) Leak test all newly connected joints and those in the repair area. (See paragraph 4-8.)

(10) Evacuate and charge the refrigerant system. (See paragraphs 4-9 and 4-10.)

Follow-on Procedures:
1. Install top condenser cover. (See paragraph 3-25.)
2. Connect power.

4-81. LOW PRESSURE SWITCH (S5)

Preliminary Procedures:
1. Disconnect power.
2. Remove air conditioner from shelter, if necessary. (See paragraph 3-6.)
3. Remove top condenser cover. (See paragraph 3-25.)
4. Remove left end condenser cover. (See paragraph 3-27.)

a. Inspect

(1) Check that mounting screws and terminal attachment screws are in place and secure. Tighten if loose. Replace if missing.

(2) Check that capillary line is not kinked, mashed, or broken. Replace switch if capillary line is damaged.

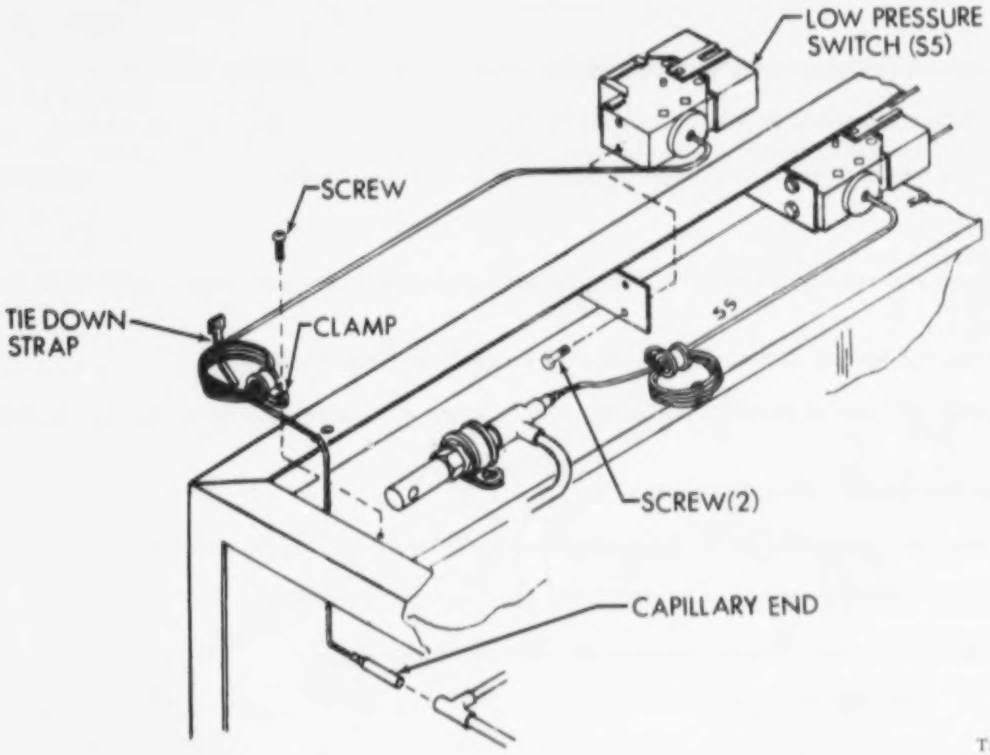


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Figure 4-85. Low Pressure Switch (S5)

b. Test. Use a continuity tester or multimeter to check for continuity between terminals 1 and 2 on switch. If there is continuity, the switch is properly closed. If no continuity is found, switch must be replaced.

c. Removal

(1) Discharge the refrigerant system per paragraph 4-5.

(2) While purging the system with nitrogen, debraze the capillary end from the tube tee. (See paragraphs 4-6 and 4-7.)

(3) Using a screwdriver, remove the screw clamp from the coil of capillary tubing.

(4) Tag and disconnect the two leads.

(5) Using screwdriver or wrench, remove two screws holding the pressure switch.

(6) Remove the pressure switch.

d. Installation

(1) Position pressure switch on bracket and aline holes.

(2) Using screwdriver or wrench, secure the pressure switch to bracket with two screws.

(3) See tags, wire marking, and wiring diagram (figure 4-3), and connect leads.

(4) Remove tags.

(5) Carefully form and position capillary tubing. Coil excess capillary tubing in three loops located at clamp attachment point.

(6) While purging the system with nitrogen, braze the capillary end into the tube tee. (See paragrapns 4-6 and 4-7.)

(7) Using screwdriver, secure the capillary loops with a screw and clamp, and three equally spaced tiedown straps.

(8) Replace the dehydrator. (See paragraph 4-73.)

(9) Leak test all newly connected joints and those in the repair area. (See paragraph 4-8.)

(10) Evacuate and charge the refrigerant system. (See paragraphs 4-9 and 4-10.)

Follow-on Procedures:
1. Install top condenser cover. (See paragraph 3-25.)
2. Install left end condenser cover. (See paragraph 3-27.)
3. Install air conditioner on shelter. (See paragraph 3-6.)
4. Connect power.

4-82. PRESSURE RELIEF VALVE

Preliminary Procedures:
1. Disconnect power.
2. Remove top condenser cover. (See paragraph 3-25.)

a. Inspect

(1) Check for evidence of leakage. Leak test per paragraph 4-8, if leak is suspected.

(2) Check that mounting is secure.

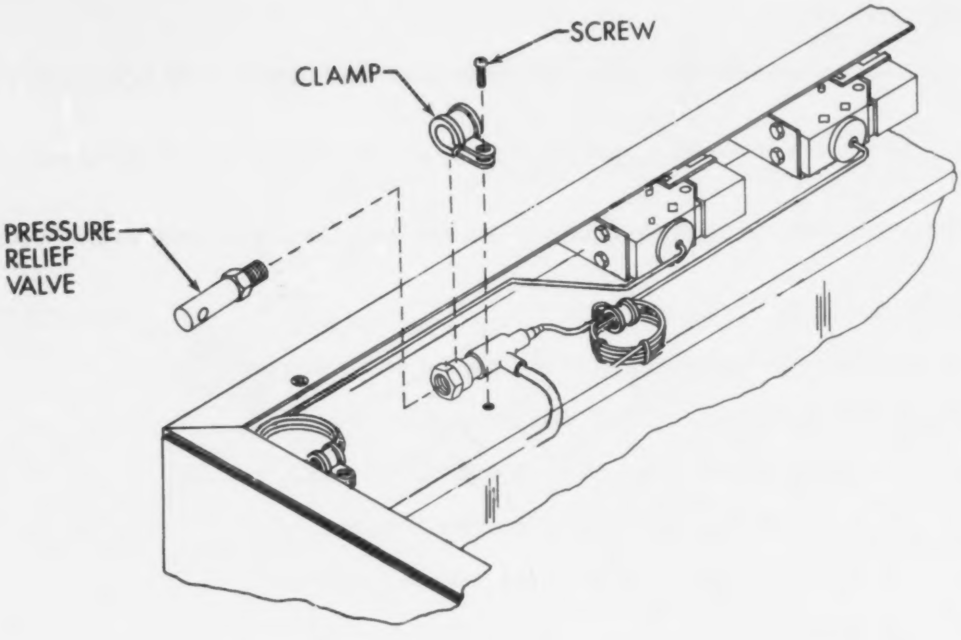

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Figure 4-86. Pressure Relief Valve

b. Removal

(1) Discharge the refrigerant system per paragraph 4-5.

(2) Using screwdriver, remove screw and clamp from top of coil housing.

(3) Use two wrenches. Hold fitting so that it is not twisted, and unscrew pressure relief valve.

c. Installation

(1) Apply antisieze tape, item 16, Appendix E, to threads of valve.

(2) Use two wrenches. While holding adapter fitting, screw pressure relief valve in place.

(3) Using screwdriver, secure relief valve adapter with screw and clamp.

(4) Replace the dehydrator. (See paragraph 4-73.)

(5) Leak test all newly connected joints and those in the repair area. (See paragraph 4-8.)

(6) Evacuate and charge the refrigerant system. (See paragraphs 4-9 and 4-10.)

Follow-on Procedures: 1 Install top condenser cover. (See paragraph 3-25.)

2. Connect power.

4-83. CONDENSER COIL INSPECTION AND CLEANING/INSTALLED

Preliminary Procedures:
1. Disconnect power.
2. Remove top condenser cover. (See paragraph 3-25.)
3. Remove condenser guard and condenser inlet EMI screen. (See paragraph 3-28.)

a. Inspection of installed items.

(1) Check for accumulated dirt. Clean if an accumulation of dirt is evident.

(2) Check fins for dents, bent edges or any condition that would block or distort air flow. Straighten all damaged fins with a plastic fin comb.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm^2).

CAUTION

Do not use steam to clean coil.

b. Cleaning. Clean coil with a soft bristled brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi or less from the inside of the coil to blow the dirt out. Take care to avoid fin damage. When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes.

c. Repair/Replacement. Should a leak or major damage be evident, go to paragraph 4-84.

Follow-on Procedures:
1. Install condenser guard and condenser inlet EMI screen. (See paragraph 3-28.)
2. Install top condenser cover. (See paragraph 3-25.)
3. Connect power.

4-84. CONDENSER COIL

For inspection and cleaning of installed coil, see paragraph 4-83.

Preliminary Procedures:
1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove top condenser cover. (See paragraph 3-25.)
3. Remove right end condenser cover. (See paragraph 3-26.)
4. Remove left end condenser cover. (See paragraph 3-27.)
5. Remove condenser guard and condenser inlet EMI screen. (See paragraph 3-28.)
6. Discharge refrigerant system. (See paragraph 4-5.)
7. Remove high pressure switch. (See paragraph 4-80.)

NOTE

Wrap wet rags near joints being brazed.

Use tape to cover open joints.

8. Remove low pressure switch. (See paragraph 4-81.)

9. Remove compressor. (See paragraph 4-88.)

10. Remove solenoid valve L1, bracket, and related piping. (See paragraphs 4-70 and 4-71.)

11. Remove relief valve and related piping. (See paragraph 4-82.)

a. Removal

(1) While purging the system with nitrogen, debraze the remaining tubing from the coil and area of the coil. (See paragraphs 4-6 and 4-7.)

(2) Using screwdriver, remove the ten screws that attach the coil to the housing.

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage on the coil.

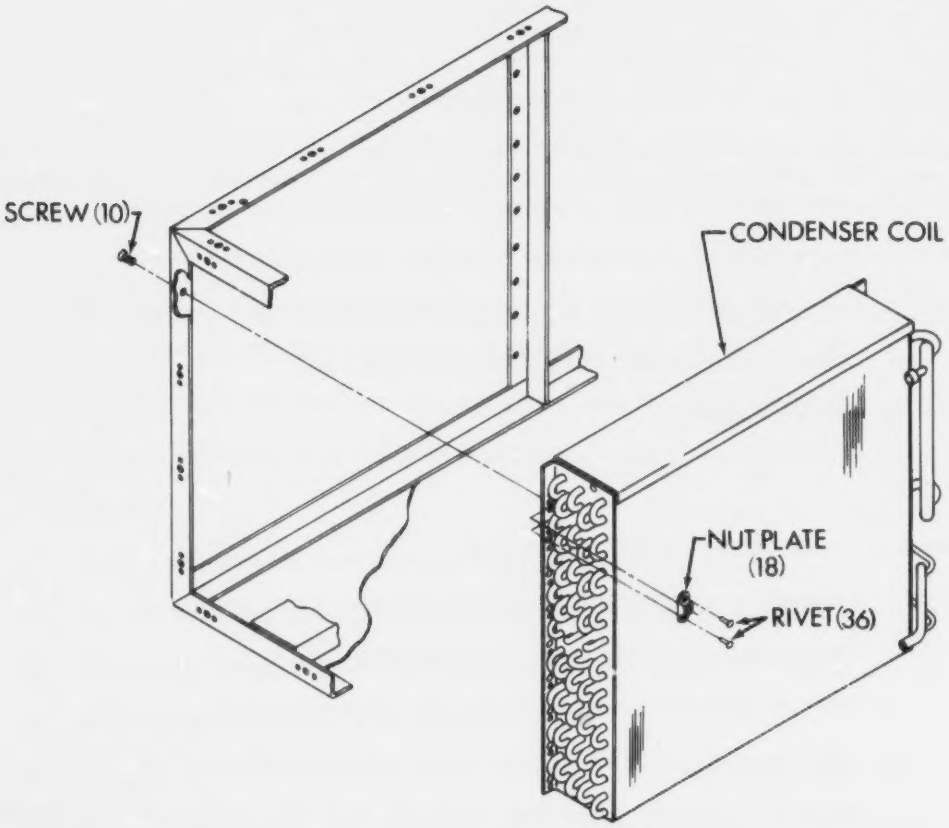

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Figure 4-87. Condenser Coil

(3) Carefully tilt coil and remove from left end.

b. Repair

(1) Repairs are limited to replacement of nut plates, rivets, and the straightening of mashed fins.

(2) Plate nuts may be removed by drilling out the old rivets using a drill bit slightly smaller than the diameter of the rivet.

(3) Install new plate nut(s) and rivets.

(4) If fins are mashed or dented so that the air flow across the coil would be blocked, straighten them using a plastic fin comb.

c. Installation

WARNING

When handling coils, wear gloves to avoid cuts and reduce fin damage on the coil.

(1) Carefully tilt coil and place into position in housing, through left end.

(2) Using screwdriver, secure coil to housing with ten screws.

(3) No air passage is permitted at top or bottom of condenser coil. Seal these areas with insulation. Bond the insulation in place with adhesive item 12, Appendix E.

(4) While purging the system with nitrogen, braze the tubing joints. (See paragraphs 4-6 and 4-7.)

(5) Install the following components:

Solenoid valve (L1), bracket, and related piping
per paragraphs 4-70 and 4-71.
Compressor, per paragraph 4-88.

Low pressure switch, per paragraph 4-81.

High pressure switch, per paragraph 4-80.
Relief valve and related piping, per paragraph 4-82.

(6) Replace the dehydrator. (See paragraph 4-73.)

(7) Check to be sure all tubing has been reconnected.

(8) Leak test all newly connected joints and those in the repair area. (See paragraph 4-8.)

(9) Evacuate and charge the refrigerant system. (See paragraphs 4-9 and 4-10.)

Follow-on Procedures:

1. Install condenser guard and condenser inlet EMI screen. (See paragraph 3-28.)
2. Install left end condenser cover. (See paragraph 3-27.)
3. Install right end condenser cover. (See paragraph 3-26.)
4. Install top condenser cover. (See paragraph 3-25.)
5. Install air conditioner on shelter. (See paragraph 3-6.)

4-85. INSULATION

Preliminary Procedures:
1. Disconnect power.
2. Remove top condenser cover. (See paragraph 3-25.)
3. Remove the air conditioner from shelter if necessary. (See paragraph 3-6.)
4. Remove left end condenser cover. (See paragraph 3-27.)

a. Inspection

(1) No air passage is permitted at top or bottom of condenser coil. Check to see that insulation strips are in place to prevent air by pass of coil.

(2) Reglue if loose.

(3) Replace if missing.

b. Removal

NOTE

Prior to removal of old insulation, cut the new replacement material to size using the old item as a sample.

(1) Remove as much old insulation material as possible, by pulling or scraping it away from the metal surface.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

(2) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

c. Installation

(1) Cut to size.

NOTE

Insulation at top of coil should be attached in proper position to top metal cover of condenser coil. Insulation at bottom should be attached to condenser housing angle face below coil.

(2) Be sure that the surface to which the insulation is to be applied is clean and free of paint and old adhesive material.

(3) Coat the mating surfaces of the metal and the insulation with adhesive (item 12, Appendix E). Let both surfaces air dry until the adhesive is tacky, but will not stick to the fingers.

(4) Starting with an end, carefully attach the insulation to the metal. Press into firm contact all over.

Follow-on Procedures:

1. Install left end condenser cover. (See paragraph 3-27.)
2. Install top condenser cover. (See paragraph 3-25.)
3. Install the air conditioner on shelter. (See paragraph 3-6.)
4. Connect power.

4-86. TUBING AND FITTINGS (CONDENSER ASSEMBLY)

The condenser assembly contains a number of pieces of copper tubing in a variety of material grades, sizes, lengths, and shapes and a number of elbows, tees, and adapters. Observe the following when replacing any piece of tubing or fitting in the system:

Preliminary Procedures:

1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove covers and parts as necessary to have access to repair area.

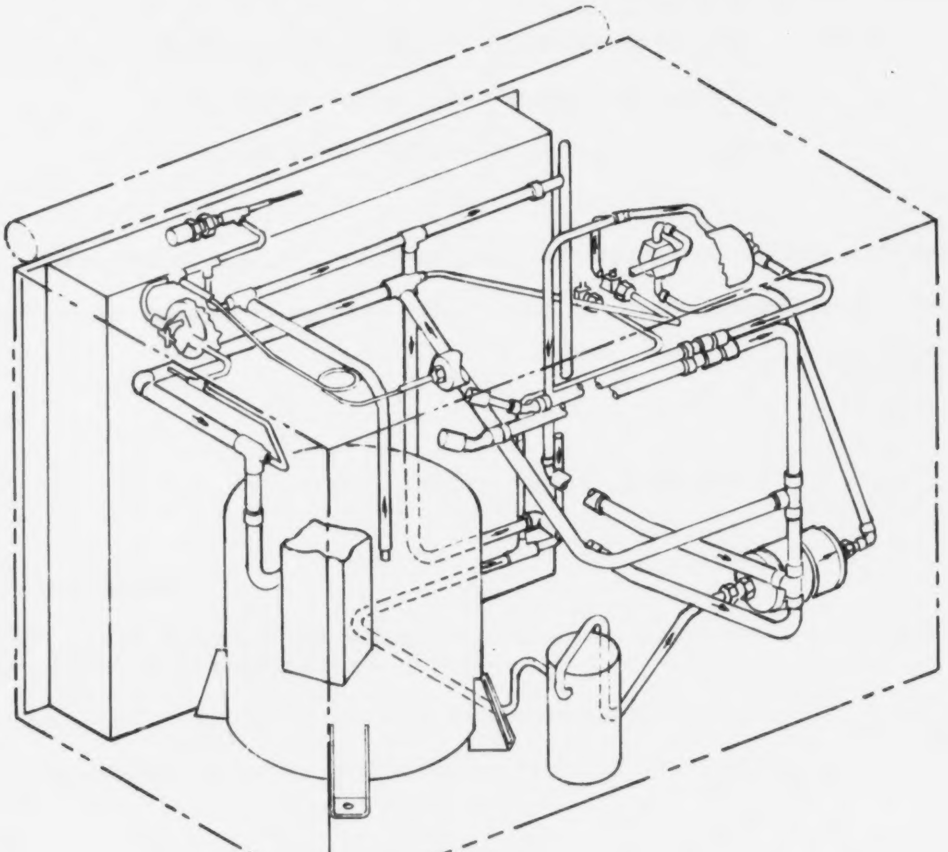

Figure 4-88. Refrigeration Piping, Condenser Section

WARNING

Be sure the refrigeration system is fully discharged and purged, and that dry nitrogen is flowing through the system at a rate of less than 1-2 cfm (0.028 - 0.057 m^3/minute) before brazing or debrazing.

a. Replace tubing and fittings only with equal material, grade, size, length and shape as the item removed.

b. Leak test the entire refrigeration system in accordance with paragraph 4-8 after any replacement action that required brazing.

c Replace the dehydrator and leak test the dehydrator flare fittings as the final step in any maintenance action that required the refrigeration pressure system to be opened.

d. Evacuate and charge the refrigeration system in accordance with paragraphs 4-9 and 4-10 after all other maintenance actions are completed.

4-87. RESILIENT MOUNTS, COMPRESSOR

Preliminary Procedures:
1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove top condenser cover. (See paragraph 3-25.)
3. Remove left end condenser cover. (See paragraph 3-27.)

a. Inspect

(1) Check to be sure that all compressor mounting hardware is in place. Replace missing parts.

(2) Check that resilient mounts are not mashed, split, deformed, or missing. Replace if damaged or missing.

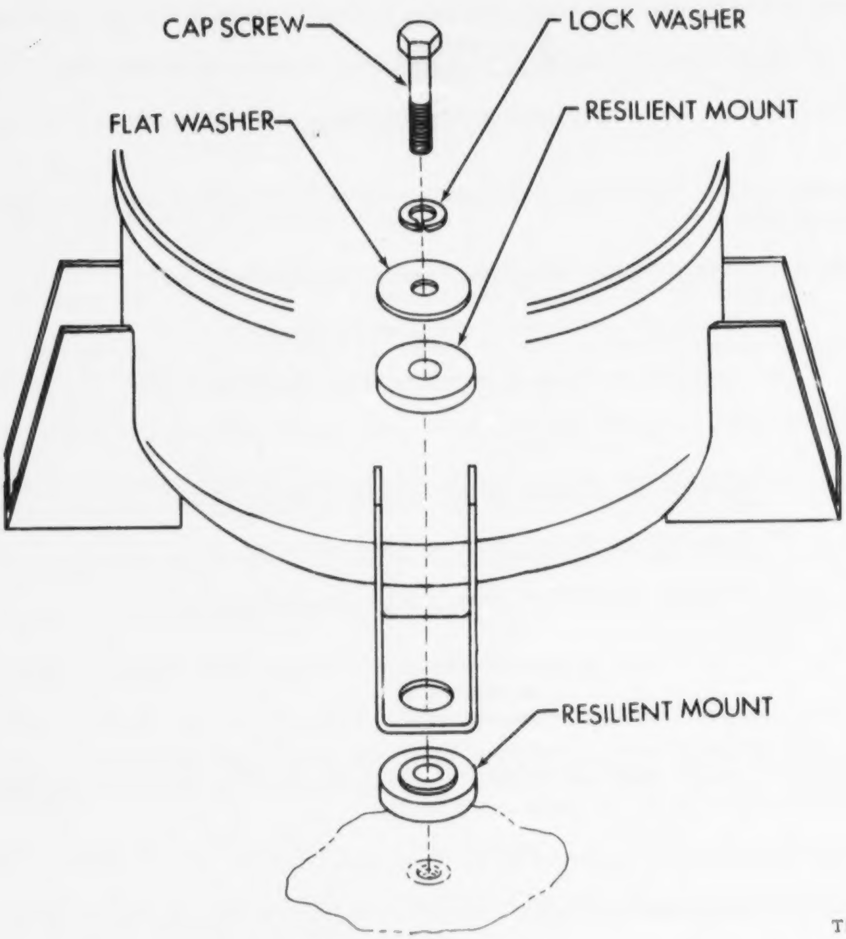

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Figure 4-89. Resilient Mounts, Compressor

b. Removal/Installation

(1) Using socket, extension, and ratchet; remove four cap screws, lock washers, flat washers, and resilient mounts from top of compressor mounting feet.

(2) Replace resilient mounts that are under the compressor feet, one at a time.

(3) Tilt compressor high enough to slide resilient mount out from under foot.

NOTE

The smaller diameter necked portion of the resilient mount goes toward compressor foot.

(4) With the smaller diameter (necked portion) of the resilient up, slide the resilient mount back under the compressor foot. The necked portion should fit into hole in compressor foot.

(5) Repeat steps (3) and (4) above on remaining three resilient mounts, if they are to be replaced.

(6) Place four top resilient mounts necked portion down into holes in compressor feet.

(7) Using socket, extension, and ratchet, secure the compressor with four cap screws, lock washers, and flat washers.

(8) To obtain proper loading, tighten cap screw until contact is made with all parts. Then, turn cap screw head 2 1/2 to 3 1/2 more turns.

Follow-on-Procedures:
1. Install left end condenser cover. (See paragraph 3-27.)
2. Install top condenser cover. (See paragraph 3-25.)
3. Install air conditioner on shelter. (See paragraph 3-6.)

4-88. COMPRESSOR

Preliminary Procedures:
1. Remove air conditioner from shelter. (See paragraph 3-6.)
2. Remove top condenser cover. (See paragraph 3-25.)
3. Remove left end condenser cover. (See paragraph 3-27.)

a. Inspect/Test

WARNING

Disconnect input power to the air conditioner before performing any maintenance to the electrical system. Voltages used can be lethal. Shutting the unit off at the control module does not disconnect power to the compressor heater.

(1) Be sure power has been *disconnected* from air conditioner.

(2) Electrically test the heater element, heater thermostat, wiring harness, and motor as follows.

(3) Disconnect wiring harness at connectors P10 and J10 (located on the compressor junction box).

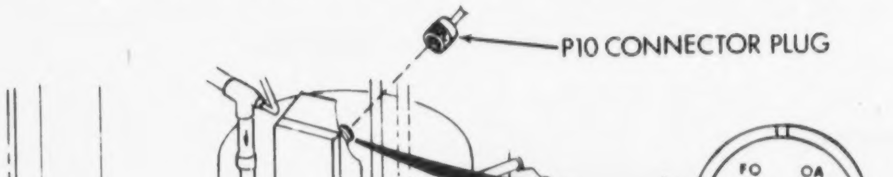

Figure 4-90. Compressor Electrical Test

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WARNING

Do not touch heating element.

(4) *Carefully* feel *lower part* of compressor.

- If air conditioner has been connected to power supply for at least four hours, compressor should feel *warm* (100 to 120°F). If not warm, test crankcase heater for continuity.
- If air conditioner has not been connected to power supply for at least four hours, compressor should be at *ambient* temperature.

(5) Using multimeter, test crankcase heater, and thermostat circuit at J10 connector:

- Using multimeter, test resistance from pin F to pin G. Resistance should be 950 to 1430 ohms. Lower reading indicates short, and infinite reading indicates an open.

(6) Using multimeter, test crankcase heater, and thermostat at junction box:

- Remove compressor junction box cover.
- Open connection between thermostat lead and heater lead.
- Check heater continuity between open connection and J10-F. If open, heater should be replaced.
- Check thermostat continuity between open connection and J10-G. If open, thermostat should be replaced.

(7) Using multimeter, test compressor motor windings.

- Check continuity between pins A, B, and C and the compressor body. No continuity should exist. If continuity exists, the compressor is bad.
- Test 3 phase windings at J10:

  A to B

  B to C

  A to C

  All resistances should be above zero and less than 2 ohms.

- Test resistance between pin D and pin E. Resistance should be *zero* indicating thermostatic switch is closed.
- Compressor containing shorted, open or grounded winding or open thermostatic switch, should be replaced.
- If compressor windings are bad, check for compressor burn out prior to installing a new compressor. (See instructions in compressor removal.)

b. Repair. The compressor and motor assembly are hermetically sealed in a metal canister and cannot be repaired. The crankcase heater element, and related parts, and the electrical connector are attached to the canister externally and may be replaced without opening the refrigeration pressure system.

c. Heater replacement. (Refrigerant system discharge is not required.)

(1) Check to see that the power has been disconnected at the power source and covers have been removed during access and testing proceed as follows.

WARNING

Allow heater to cool before touching. Severe burns can result from touching hot heater.

(2) Tag and disconnect two heater leads from junction box terminals.

(3) Using pliers, remove band on heater.

(4) Spread the heater ends to clear junction box.

(5) Lift heater up and off compressor crankcase.

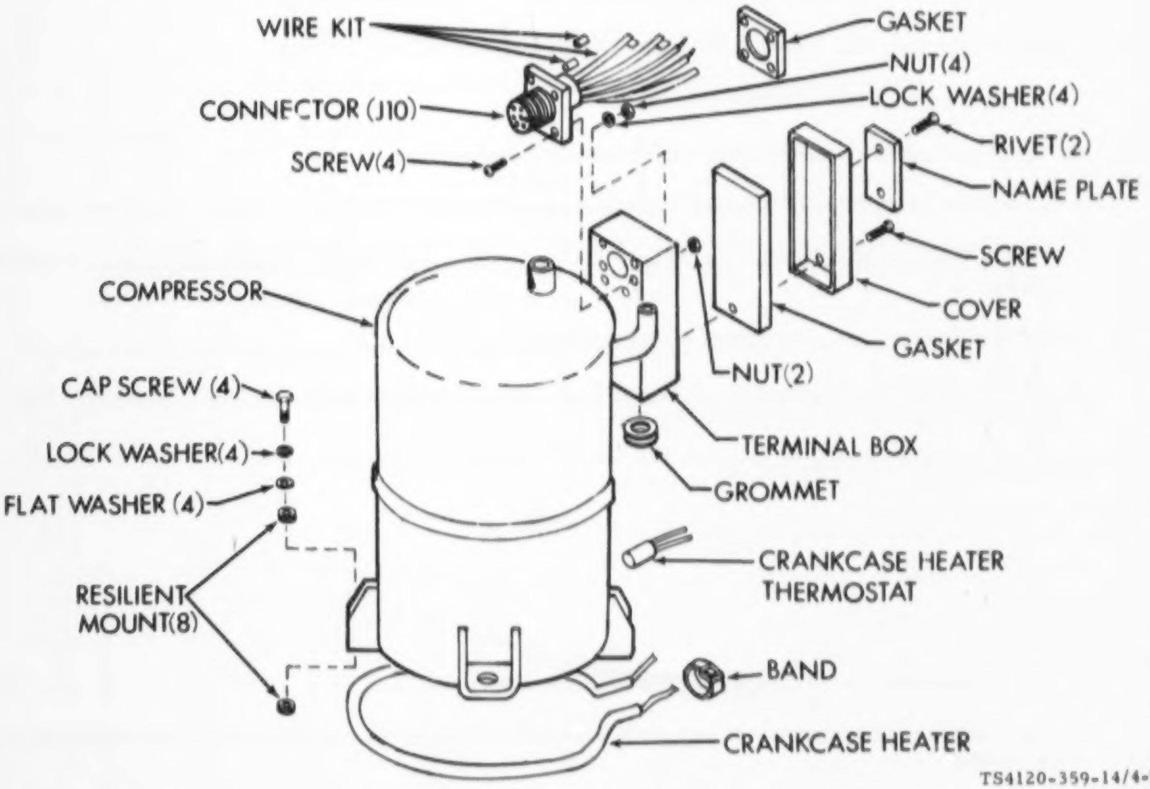

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Figure 4-91. Compressor

(6) Install new heater as follows.

(7) Spring heater ends apart and place heater down and around compressor in position on crankcase. Using pliers, secure heater on crankcase with metal band.

(8) Run leads through the grommet in the compressor junction box.

(9) See tags on the removed heater. Connect heater leads to J10 pins F and G.

(10) If this completes the repair, install terminal box cover.

d. Connector replacement. (Refrigerant system discharge is not required.)

(1) Assuming that the power has been disconnected at the power source, and covers have been removed during access and testing, proceed as follows.

(2) Remove the retaining hardware from the connector. Pull the connector out of the box to gain access to the solder connections.

(3) Tag and unsolder wires.

(4) Using tags and wiring diagram (figure 4-3), solder wires to new connector. Remove the tags.

(5) Secure the connector to the compressor junction box with screws and lock washers.

e. Compressor replacement

(1) Check to see that the power has been disconnected at the power source, connector plug (P10) was disconnected and that covers have been removed during access and test, proceed as follows:

(2) Discharge the refrigerant system per paragraph 4-5.

(3) While purging the system with nitrogen, debraze the tubing. (See paragraphs 4-6 and 4-7.)

(4) Using socket, extension, and ratchet, remove four cap screws, lock washers, and resilient mounts from top of compressor mounting feet.

(5) Spring tubing up and out of the way.

WARNING

If compressor burn out is suspected, use care when handling compressor to avoid touching compressor sludge. Acid in sludge can cause burns.

(6) Carefully slide compressor from housing through left end.

(7) Check the compressor to see if a motor burn out is indicated.

f. Compressor motor burnout

(1) After removal of a bad compressor from the refrigeration system, remove all external tubing and tip the compressor toward the discharge port to drain sample of oil into a clear glass container.

WARNING

Avoid inhaling fumes and burns from any acid formed by burn out of oil and refrigerant.

(2) If the oil is clean and clear, and does not have a burnt acid smell, the compressor did not fail because of motor burn out. If a burn out is not indicated, proceed to g.

(3) If the oil is black, contains sludge and has a burnt acid odor, the compressor failed because of motor burn out.

(4) You must clean the entire refrigeration system after a burn out has occurred, since contaminants will have been carried to many corners and restrictions in the piping and fittings. These contaminants will soon mix with new refrigerant gas and compressor oil to cause repeated burn outs.

(5) Remove the filter-drier, and blow down each leg of the refrigeration system. To do this, connect a cylinder of dry-nitrogen to each filter-drier connection, in turn, and open the cylinder shutoff valve for at least 30 seconds at 50 psig (3.5 kg/cm^2) pressure.

(6) Connect the two filter-drier fittings with a jumper, locally manufactured from refrigerant tubing and fittings.

(7) Clean system by back-flushing with liquid R-11 (item 17, Appendix E) from pressurized cylinder or circulating pump and reservoir with pressure of at least 100 psig.

(8) If pump is used, connect the discharge line of the refrigerant system to the discharge side of pump.

(9) Connect a line containing a filter to the suction line in the unit.

NOTE

An unused filter-drier or other suitable medium may be used as the filter.

(10) The other end of the temporary suction line should be connected to a small drum or suitable reservoir.

(11) A line should be run from the bottom of the reservoir to the inlet of the pump.

WARNING

Avoid inhaling fumes and burns from any acid formed by burn out of oil and refrigerant. Wear gas mask if area is not thoroughly ventilated. Wear protective goggles or glasses to protect eyes. Wear rubber gloves to protect hands.

(12) Fill reservoir with fluorocarbon refrigerant, R-11, and start the pump. Continue filling the reservoir with refrigerant, R-11, until it begins to pour out of the return line. Continue flushing for at least 15 minutes.

(13) Reverse the pump connections, replace the filter with a new filtering medium, and backflush the system for an additional 15 minutes.

(14) Remove the pump, reservoir, filter, and filter-drier jumper. Place an empty container below the compressor connections, and connect a cylinder of dry nitrogen to each filter-drier connection in turn. Blow down each leg of the system at 50 psig (3.5 kg/cm^2) for at least 30 seconds.

(15) Disconnect the dry nitrogen cylinder. Cap or plug open connections if compressor and filter-drier are not to be installed immediately.

g. Compressor installation.

CAUTION

The compressor is supplied with a complete charge of oil. Take care that oil is not lost when handling and installing compressor.

NOTE

If any refrigeration piping was disconnected with the compressor being replaced, transfer the piping to the replacement compressor before installing it in the air conditioner.

(1) Slide compressor into condenser housing.

NOTE

The smaller diameter (necked portion) of the resilient mount goes toward compressor foot.

(2) With the smaller diameter (necked portion) of the resilient mount up, place four resilient mounts under the compressor feet. The necked portion should fit into holes in compressor feet.

(3) Place four top resilient mounts necked portion down into holes in compressor feet.

(4) Using socket, extension, and ratchet, secure the compressor with four cap screws, lock washers, and flat washers.

(5) To obtain proper loading tighten cap screw until contact is made with all parts. Then turn cap screw head 2 1/2 to 3 1/2 more turns.

(6) Wrap wet rags around compressor at connection points and while brazing direct flame away from compressor.

(7) While purging the system with nitrogen, braze the tubing joints. (See paragraphs 4-6 and 4-7)

(8) Replace the dehydrator. (See paragraph 4-73.)

(9) Connect electrical connector plug (P10) to connector (J10) on compressor terminal box.

(10) Leak test all newly connected joints and those in the repair area. (See paragraph 4-8.)

(11) Evacuate and charge the refrigerant system. (See paragraphs 4-9 and 4-10.)

Follow-on Procedures:
1. Install left end condenser cover. (See paragraph 3-27.)
2. Install top condenser cover. (See paragraph 3-25.)
3. Install air conditioner on shelter. (See paragraph 3-6.)

4-89. CONDENSER HOUSING ASSEMBLY INSPECTION

a. Check for broken welds, badly bent or dented parts, and cracked or broken parts.

b. Check that plate nuts and blind nuts are in place and secure.

c. Refer repairs to general support maintenance.

4-90. ELECTRICAL MODULE ASSEMBLY, CONDENSER SECTION (REMOVAL/INSTALLATION)

Preliminary Procedures: Disconnect power.

a. Removal

(1) Using screwdriver, remove eight screws.

(2) Pull module out of housing until connectors on back side can be reached.

(3) Disconnect P12 and P13 connector plugs, and pull module free.

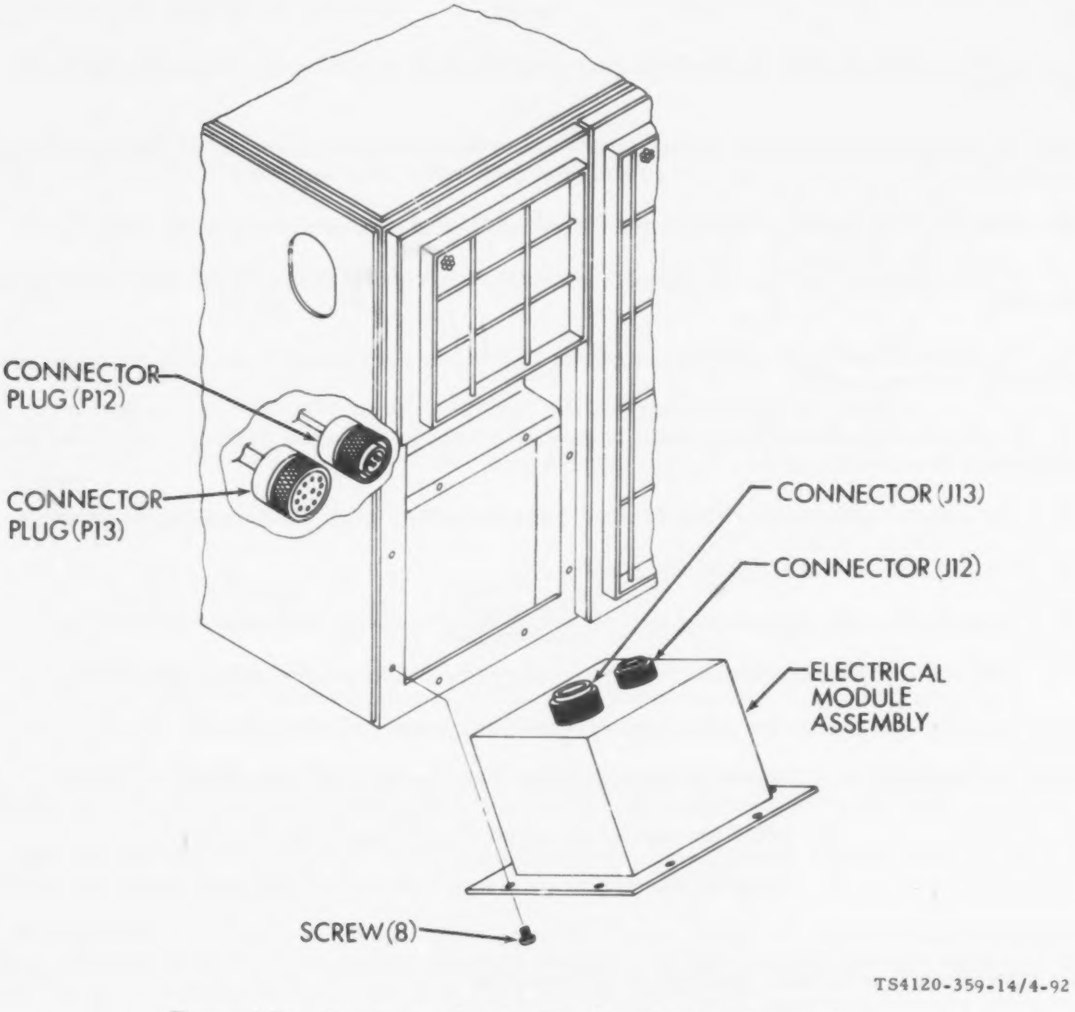


Figure 4-92. Condenser Section Electrical Module Assembly

b. Installation

(1) Connect P12 and P13 connector plugs to J12 and J13 connectors on back of module.

(2) Carefully slip module into place and aline holes.

(3) Using screwdriver, secure module with eight screws.

Follow-on Procedure: Connect power.

4-91. MODULE COVER

Preliminary Procedures: 1. Disconnect power.

2. Remove condenser section electrical module. (See paragraph 4-90.)

a. Inspect

(1) Check for broken welds, cracks, dents, and general condition. Replace if damaged.

(2) Check that screw threads inside flange are not stripped.

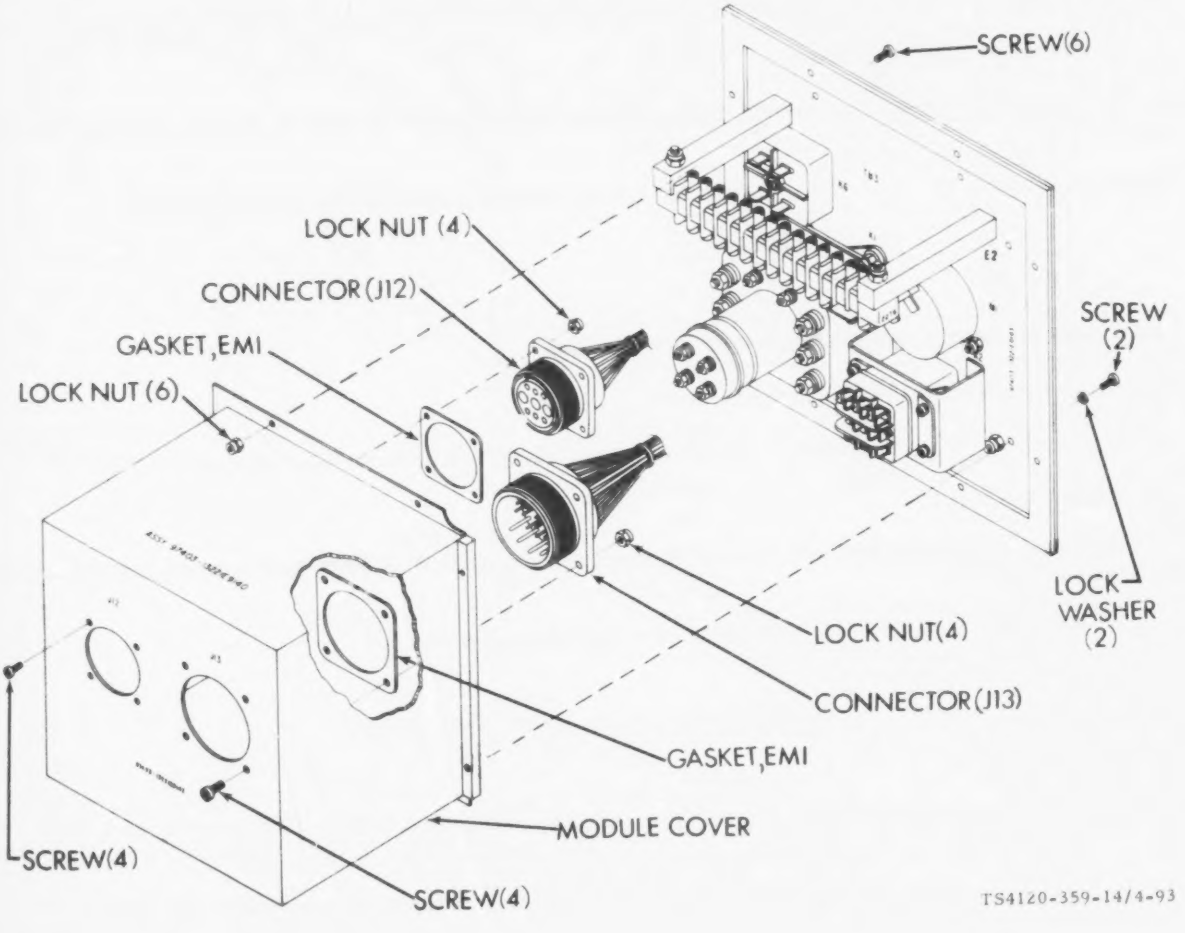


Figure 4-93. Cover, Module

b. Removal

(1) Using screwdriver and wrench, remove eight screws, six nuts, and two lock washers that hold cover to chassis.

(2) Pull cover away from chassis as far as wiring harness will allow.

(3) Using screwdriver and wrench, remove four screws and lock nuts from each of the two connectors.

(4) Separate the cover from the connectors and EMI gaskets. Take care that EMI gaskets are not lost.

c. Installation

(1) Slip EMI gasket on connector ends.

(2) Insert connector ends through holes in cover and aline holes.

(3) Using screwdriver and wrench, secure connectors and EMI gaskets with eight screws and lock nuts.

(4) Position cover on chassis.

(5) Using screwdriver and wrench, secure cover to chassis with eight screws, six lock nuts, and two lock washers.

Follow-on Procedures:
1. Install condenser section electrical module (See paragraph 4-90.)
2. Connect power.

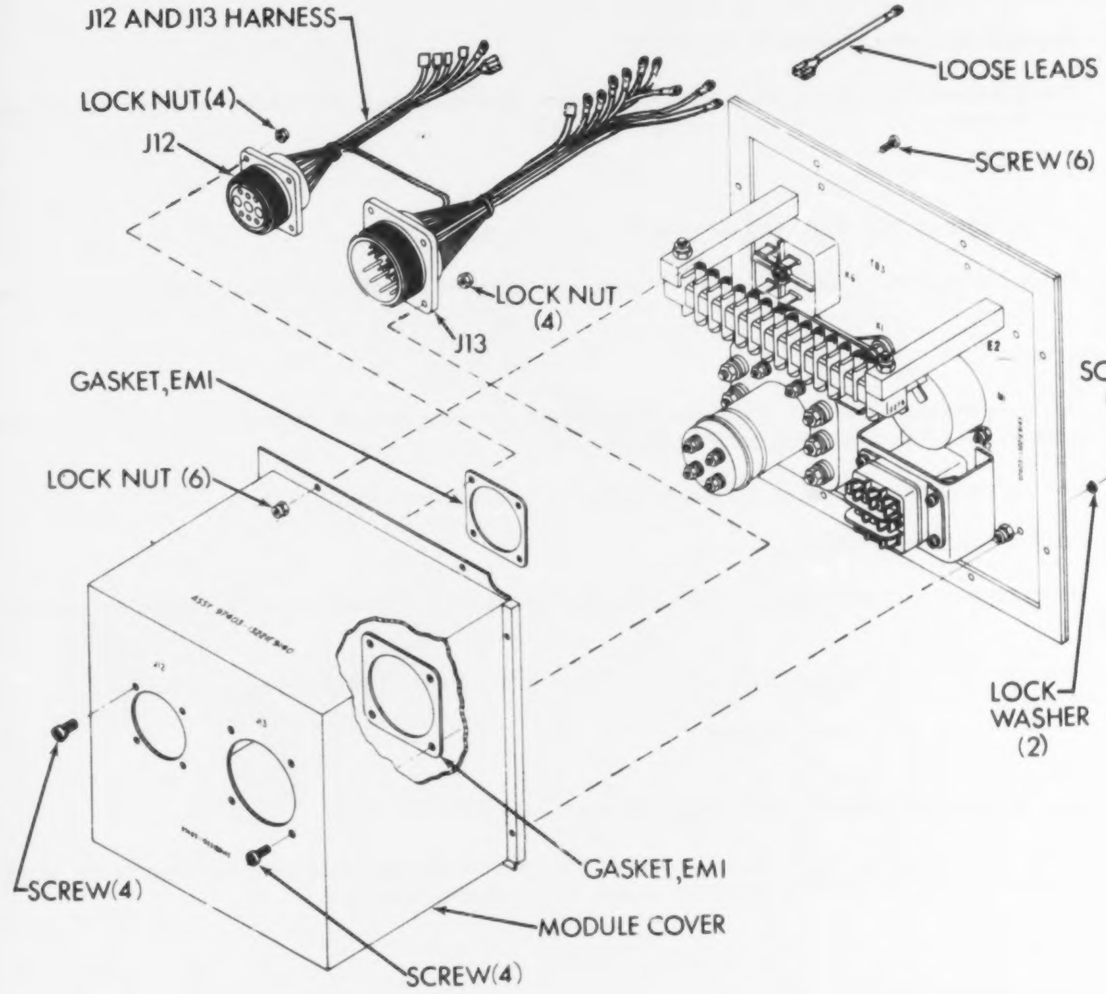
4-92. EMI GASKETS. WIRING HARNESS AND LEADS

Preliminary Procedures:
1. Disconnect power.
2. Remove condenser section electrical module. (See paragraph 4-90.)

a. Inspection/Test

(1) Using screwdriver and wrench, remove eight screws, six nuts, and two lock washers that hold cover to chassis.

(2) Pull cover away from chassis as far as wiring harness will allow.



TS4120-359-14/4-94

Figure 4-94. EMI Gaskets and Harnesses

(3) Check connectors for general condition, loose, broken, or missing contacts. Replace connectors if damaged.

(4) Check individual wires for loose solder and terminal lug connectors, cut or frayed insulation, and cut or broken wires.

(5) See wiring diagram (figure 4-3), and continuity test individual wires. Repair or replace wires with no continuity.

(6) Check that gaskets are in good condition. Replace them if they are torn, missing, or otherwise damaged.

b. Removal

(1) Tag and disconnect leads.

(2) Using screwdriver and wrench, remove screws, lock nuts, and remove the affected connectors, harnesses, and leads.

c. Repair

(1) See paragraph 4-3 for general wire repair instructions.

(2) See table 4-2 (Wire List), for wire lengths and terminal information when individual wires are replaced.

d. Installation

(1) Using screwdriver and wrench, install the connector(s) in cover with screws and lock nuts. Be sure that EMI gaskets are placed between connectors and cover.

(2) See tags and wiring diagram (figure 4-3), and reconnect leads. Remove tags.

(3) Position cover on chassis.

(4) Using screwdriver and wrench, secure cover to chassis with eight screws, six lock nuts, and two lock washers.

Follow-on Procedures:

1. Install condenser section electrical module. (See paragraph 4-90.)
2. Connect power.

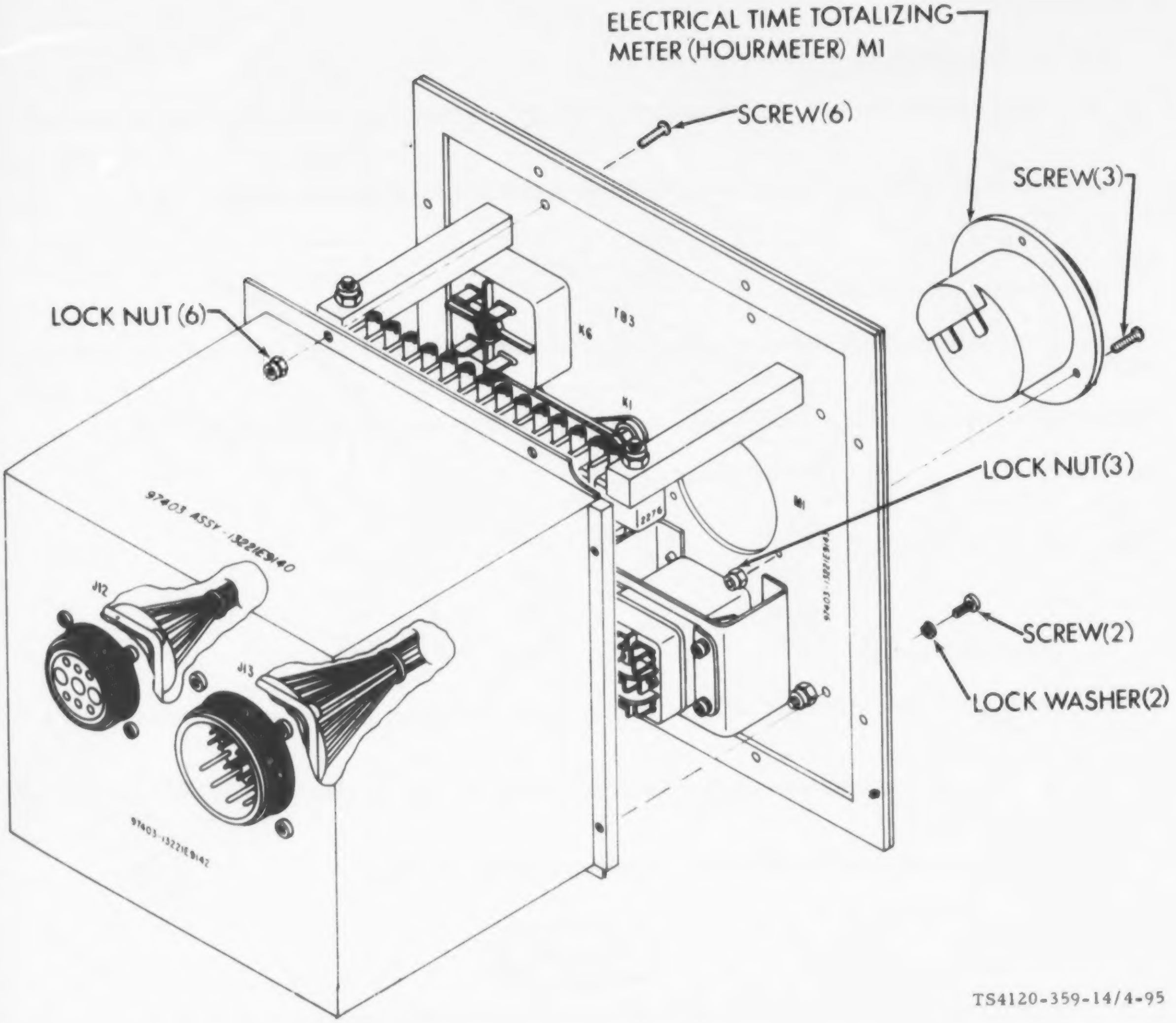
4-93. TIME TOTALIZING METER (HOURMETER) M1

a. Test. The time totalizing meter should operate and indicate elapsed operating time when the MODE SELECTOR SWITCH is in any of the operating modes. If it does not, replace it.

b. Removal

(1) Disconnect power.

(2) Remove condenser section electrical module. (See paragraph 4-90.)



TS4120-359-14/4-95

Figure 4-95. Time Totalizing Meter (Hourmeter) M1

(3) Using screwdriver and wrench, remove eight screws, six nuts, and two lock washers that hold cover to chassis.

(4) Pull cover away from chassis as far as wiring harness will allow.

(5) Tag and disconnect leads.

(6) Using screwdriver and wrench, remove three screws and lock nuts.

(7) Remove time totalizing meter.

c. Installation

(1) Position time totalizing meter on chassis.

(2) Using screwdriver and wrench, secure time totalizing meter to chassis with three screws and lock nuts.

(3) See tags, wire marking, and wiring diagram (figure 4-3), and connect leads.

(4) Remove tags.

(5) Position cover on chassis.

(6) Using screwdriver and wrench, secure cover to chassis with eight screws, six lock nuts, and two lock washers.

Follow-on Procedures: 1. Install condenser section electrical module. (See paragraph 4-90.)

2. Connect power.

4-94. RELAY (K1)

a. Test

(1) Disconnect power.

(2) Using screwdriver, remove eight screws and pull condenser section electrical module out from condenser housing.

(3) Using screwdriver and wrench, remove eight screws, six nuts, and two lock washers that hold cover to chassis.

(4) Pull cover away from chassis as far as wiring harness will allow.

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

NOTE

Electrical module assembly must be connected to an operable air conditioner with remote control assembly and 208V, 3 phase, 400 Hz power for voltage tests.

(5) The K1 relay controls the compressor motor.

(6) Check to see that P12 and P13 connector plugs are connected at back of electrical module cover.

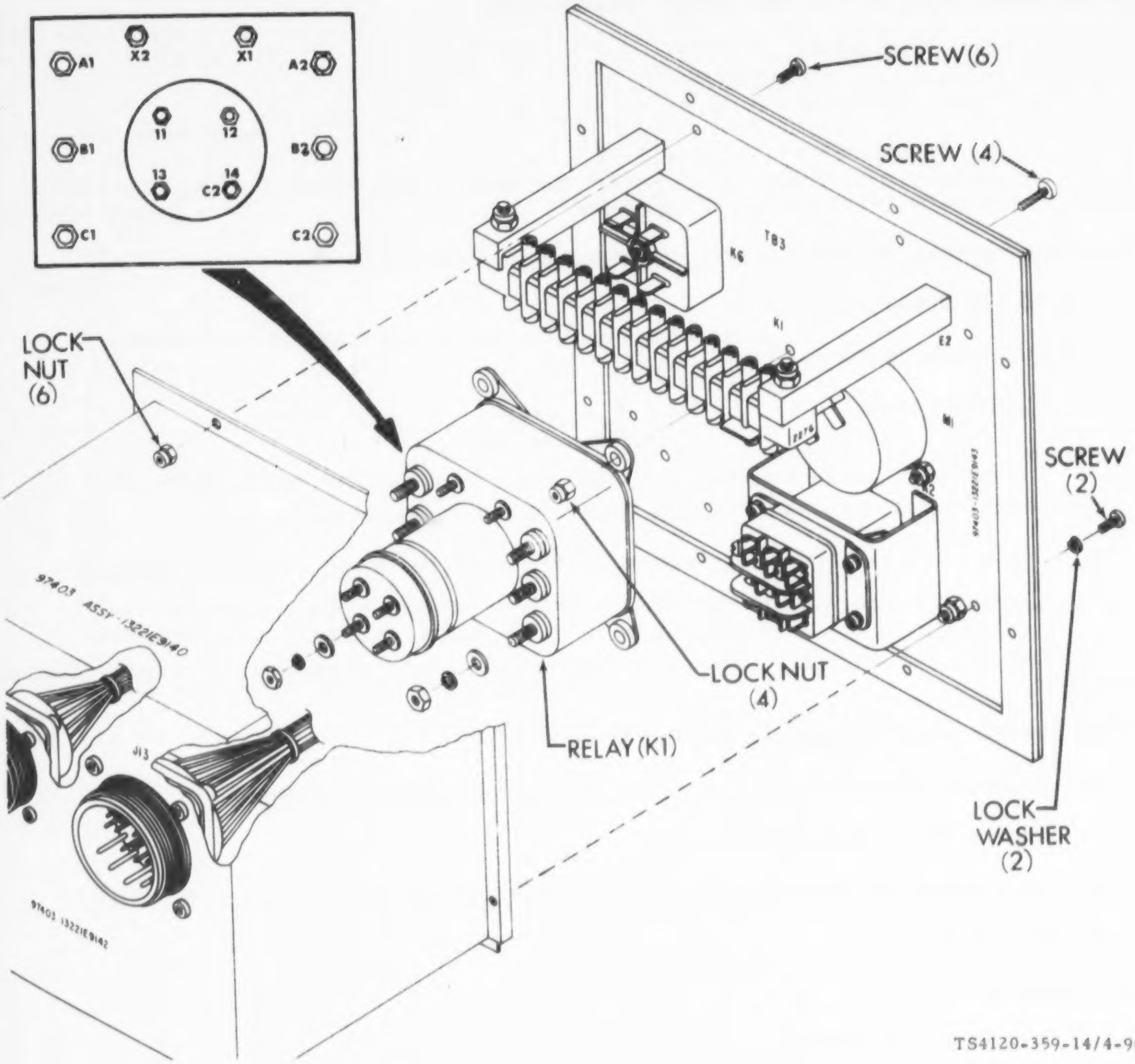


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Figure 4-96. Relay (K1)

(7) Connect power to air conditioner.

(8) Turn mode selector switch to COOL and temperature control to maximum COOLER. Using multimeter, check relay output voltage (after 60 seconds) between:

A2 and B2

B2 and C2

A2 and C2

(9) Voltage should be 197 to 229 Vac in all three phases.

(10) Check power input voltage between relay terminals:

A1 and B1

B1 and C1

A1 and C1

Voltage should be 197 to 229 Vac in all three phases.

(11) Using multimeter, check relay control voltage between X1 and X2.

(12) Voltage should be 25 to 31 Vac.

(13) Turn selector switch to OFF.

(14) Disconnect power.

b. Inspect

(1) Check for loose terminal connections. Repair or replace all loose connections.

(2) Check for cracks, evidence of overheating, and other visible damage. Replace if damaged.

c. Removal

(1) Assuming that module assembly has not been reassembled after above tests and inspection, proceed as follows:

(2) Be sure power has been disconnected.

(3) Disconnect connector plugs P12 and P13 from back of electrical module cover.

(4) Tag and remove leads from relay.

(5) Using screwdriver and wrench, remove four screws and lock nuts holding relay to chassis.

(6) Remove relay.

d. Installation

(1) Position relay on chassis.

(2) Using screwdriver and wrench, secure relay on chassis with four screws and lock nuts.

(3) See tags, wire markings, and wiring diagram (figure 4-3), and connect leads.

(4) Remove tags.

(5) Position cover on chassis.

(6) Using screwdriver and wrench, secure cover to chassis with eight screws, six lock nuts, and two lock washers.

Follow-on Procedures:

1. Install condenser section electrical module. (See paragraph 4-90.)
2. Connect power.

4-95. RELAY (K2)

a. Test

(1) Disconnect power.

(2) Using screwdriver, remove eight screws and pull condenser section electrical module out from condenser housing.

(3) Using screwdriver and wrench, remove eight screws, six nuts, and two lock washers that hold cover to chassis.

(4) Pull cover away from chassis as far as wiring harness will allow.

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

NOTE

Electrical module assembly must be connected to an operable air conditioner with remote control assembly and 208 V, 3 phase, 400 Hz power for voltage tests.

(5) The K2 relay controls the condenser blower motor.

(6) Check to see that P12 and P13 connector plugs are connected at back of electrical module cover.

(7) Connect power to air conditioner.

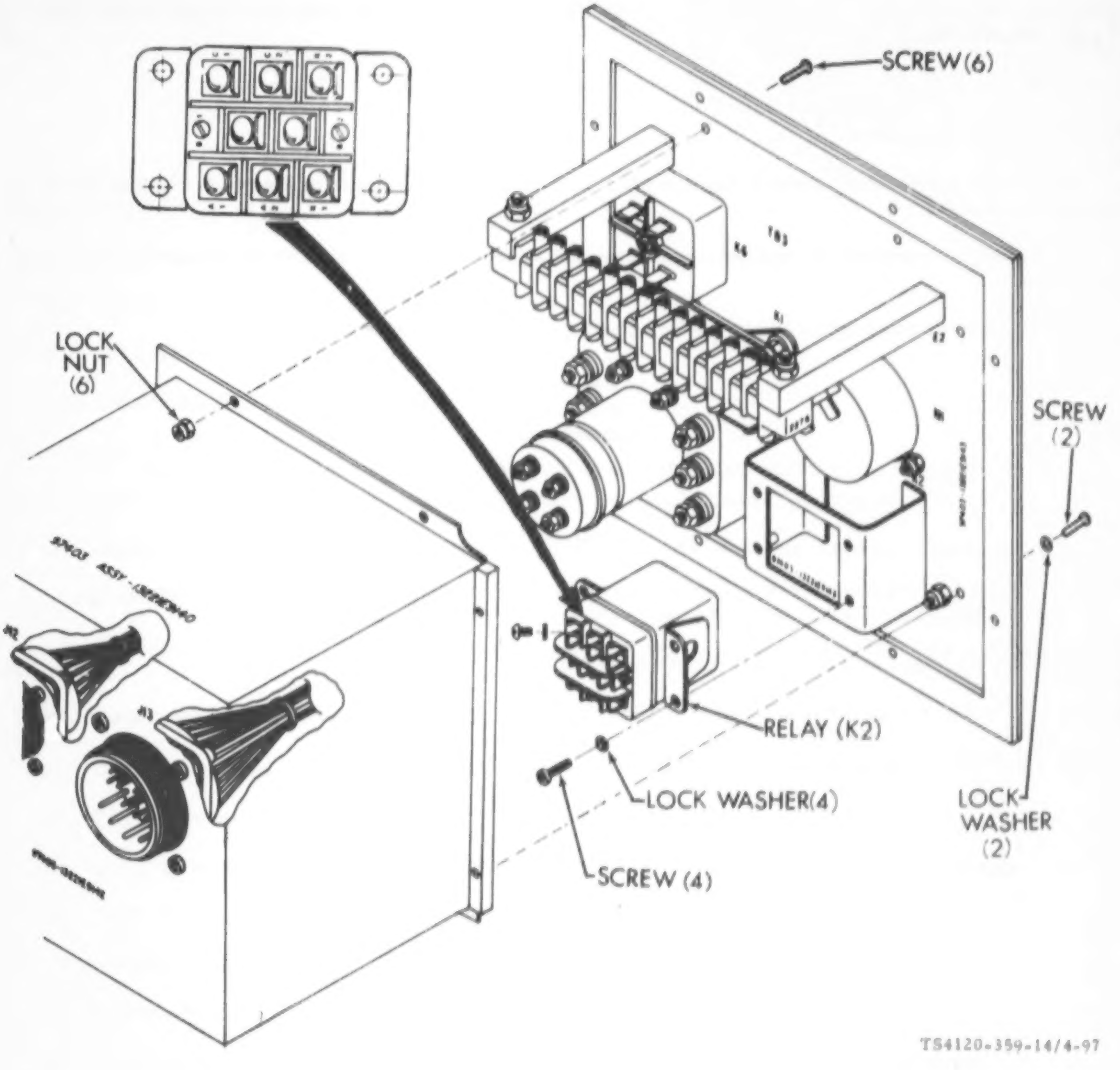


Figure 4-97. Relay (K2)

(8) Turn mode selector switch to COOL and temperature control to maximum COOLER. Using multimeter, check relay output voltage between:

A2 and B2

B2 and C2

A2 and C2

(9) Voltage should be 197 to 229 Vac in all three phases.

(10) Check power input voltage between relay terminals:

A1 and B1

B1 and C1

A1 and C1

Voltage should be 197 to 229 Vac in all three phases.

(11) Using multimeter, check relay control voltage between X1 and X2.

(12) Voltage should be 25 to 31 Vdc.

(13) Turn selector switch to OFF.

(14) Disconnect power.

b. Inspect

(1) Check for loose terminal connections. Repair or replace all loose connections.

(2) Check for cracks, evidence of overheating, and other visible damage. Replace if damaged.

c. Removal

(1) Assuming that module assembly has not been reassembled after above tests and inspection, proceed as follows.

(2) Be sure power has been disconnected.

(3) Disconnect connector plugs P12 and P13 from back of electrical module cover.

(4) Tag and remove leads from relay.

(5) Using screwdriver, remove four screws and lock washers holding relay to chassis.

(6) Remove relay.

d. Installation

(1) Position relay on chassis.

(2) Using screwdriver, secure relay on chassis with four screws and lock washers.

(3) See tags, wire markings, and wiring diagram (figure 4-3) and connect leads.

(4) Remove tags.

(5) Position cover on chassis.

(6) Using screwdriver and wrench, secure cover to chassis with eight screws, six lock nuts, and two lock washers.

Follow-on Procedures: 1. Install condenser section electrical module. (See paragraph 4-90.)

2. Connect power.

4-96. TIME DELAY RELAY (K6)

a. Test

(1) Disconnect power.

(2) Using screwdriver, remove eight screws and pull condenser section electrical module out from condenser housing.

(3) Using screwdriver and wrench, remove eight screws, six nuts, and two lock washers that hold cover to chassis.

(4) Pull cover away from chassis as far as wiring harness will allow.

WARNING

The following test must be conducted with the power on. Exercise extreme caution.

NOTE

Electrical module assembly must be connected to an operable air conditioner with remote control assembly and 208 V, 3 phase, 400 Hz power for voltage tests.

(5) Check to see that P12 and P13 connector plugs are connected at back of electrical module cover.

(6) Connect power to air conditioner.

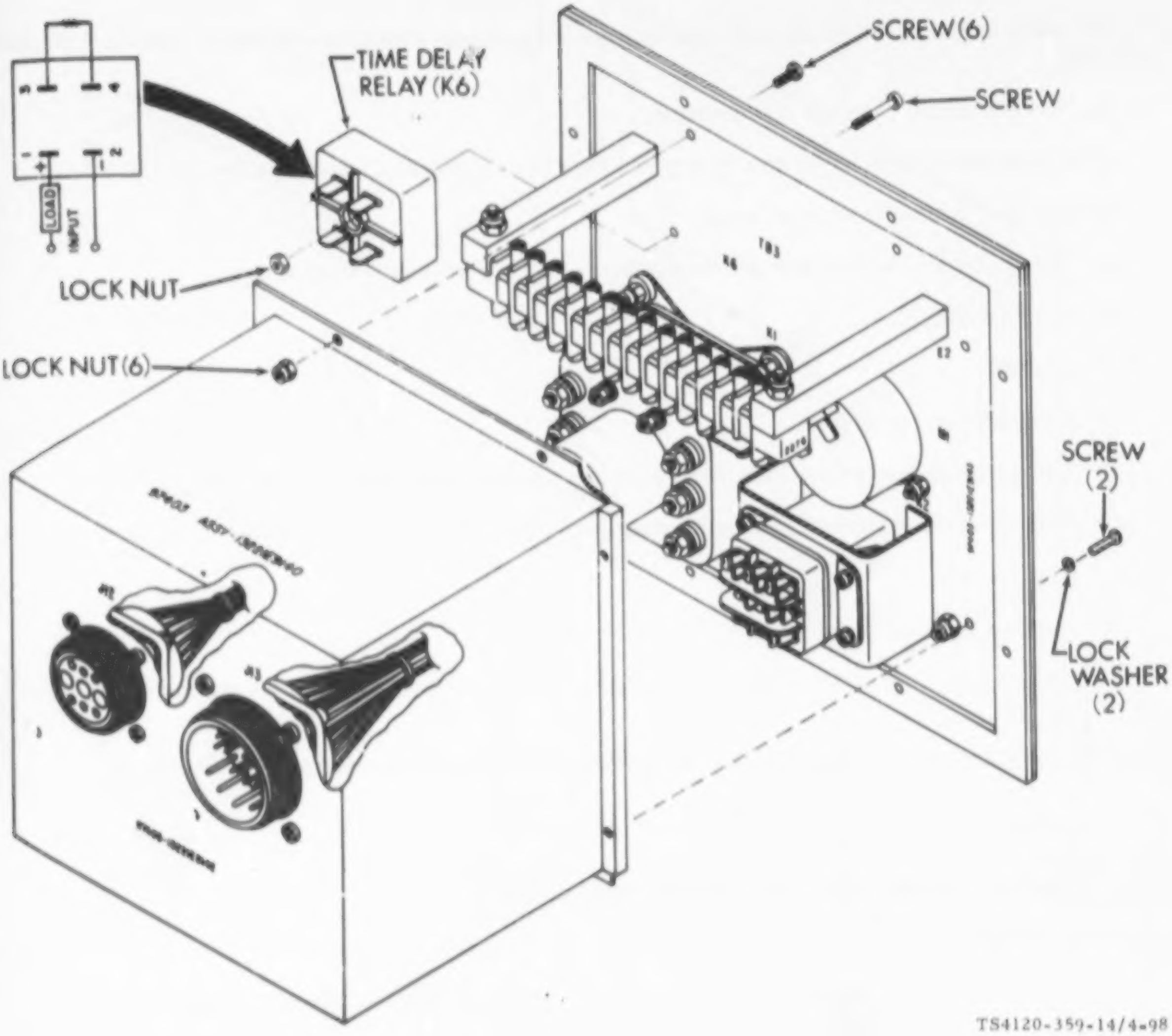


Figure 4-98. Time Delay Relay (K6)

(7) Turn mode selector switch to COOL and temperature control to maximum COOLER.

(8) Multimeter should show 25 to 31 Vdc for 15 to 60 seconds and *then* zero Vdc across terminals 1 and 2.

(9) Turn mode selector switch to OFF.

(10) Disconnect power.

b. Inspect

(1) Check for loose terminal connections. Repair or replace all loose connections.

(2) Check for cracks, evidence of overheating, and other visible damage. Replace if damaged.

c. Removal

(1) Assuming that module assembly has not been reassembled after above tests and inspection, proceed as follows.

(2) Be sure power has been disconnected.

(3) Disconnect connector plugs P12 and P13 from back of electrical module cover.

(4) Tag and remove leads from relay.

(5) Using screwdriver and wrench, remove screw and nut holding relay to chassis.

(6) Remove relay.

d. Installation

(1) Position relay on chassis.

(2) Using screwdriver and wrench, secure relay on chassis with screw and lock nut.

(3) See tags, wire markings, and wiring diagram (figure 4-3), and connect leads.

(4) Remove tags.

(5) Position cover on chassis.

(6) Using screwdriver and wrench, secure cover to chassis with eight screws, six lock nuts, and two lock washers.

Follow-on Procedures: 1. Install condenser section electrical module. (See paragraph 4-90.)

2. Connect power.

4-97. TERMINAL BOARD (TB3) AND CONNECTING LINKS

Preliminary Procedures: 1. Disconnect power.

2. Remove condenser section electrical module. (See paragraph 4-90.)

a. Inspect

(1) Using screwdriver and wrench, remove eight screws, six nuts, and two lock washers that hold cover to chassis.

(2) Pull cover away from chassis as far as wiring harness will allow.

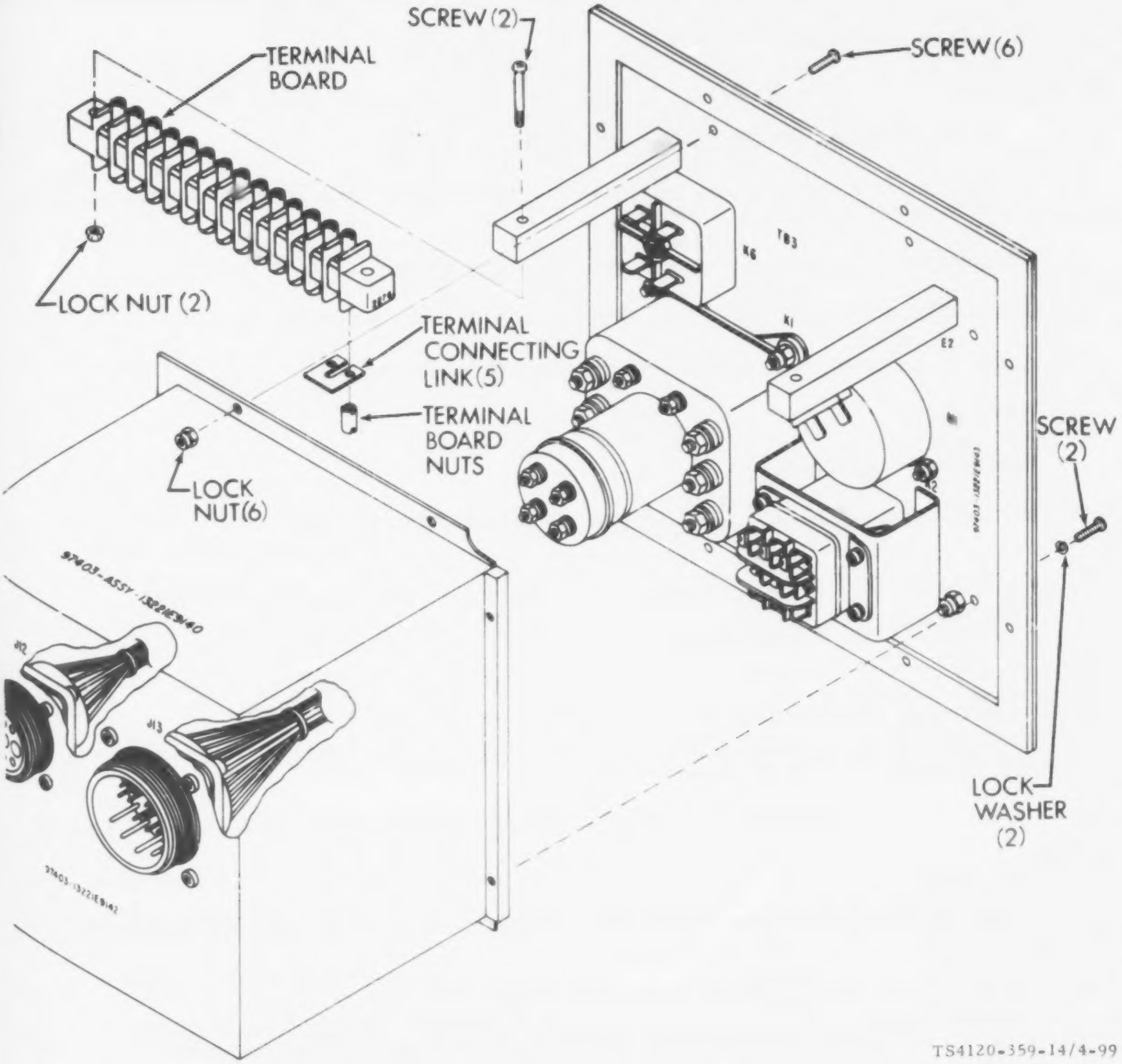


Figure 4-99. Terminal Board (TB3) and Connecting Links

(3) Check terminal board for loose or corroded terminals, cracks, and obvious damage. Replace if terminals are corroded, or if terminal board is cracked or broken.

(4) Check that terminal links are in place and in good condition. Terminals 1 and 2, 3 and 4, 6 and 7, 8 and 9, and 10 and 11 should be jumped with terminal links.

c. Removal

(1) Tag wires.

(2) Use flat tip screwdriver to remove terminal board nuts and remove leads and jumpers.

(3) Using cross tip screwdriver and wrench, remove two screws and lock nuts that hold terminal board.

(4) Remove terminal board.

d. Installation

(1) Aline terminal board and chassis mounting holes.

(2) Using cross tip screwdriver and wrench, secure terminal board (and E2 leads) with two screws and lock nuts.

(3) Place terminal links between terminals 1 and 2, 3 and 4, 6 and 7, 8 and 9, and 10 and 11.

(4) Match leads to terminals using tags, wire markings, and wiring diagram (figure 4-3).

(5) Using flat tip screwdriver, fasten leads and terminal links to terminals.

(6) Remove tags.

(7) Position cover on chassis.

(8) Using screwdriver and wrench, secure cover to chassis with eight screws, six lock nuts, and two lock washers.

Follow-on Procedures: 1. Install condenser section electrical module. (See paragraph 4-90.)

2. Connect power

4-98. CHASSIS AND SNAP FASTENER

Preliminary Procedures: 1. Disconnect power.

2. Remove condenser section electrical module. (See paragraph 4-90.)

a. Inspect

(1) Using screwdriver and wrench, remove eight screws, six nuts, and two lock washers that hold cover to chassis.

(2) Pull cover away from chassis as far as wiring harness will allow.

(3) Check for broken welds, cracks, dents, and general condition. Replace if damaged.

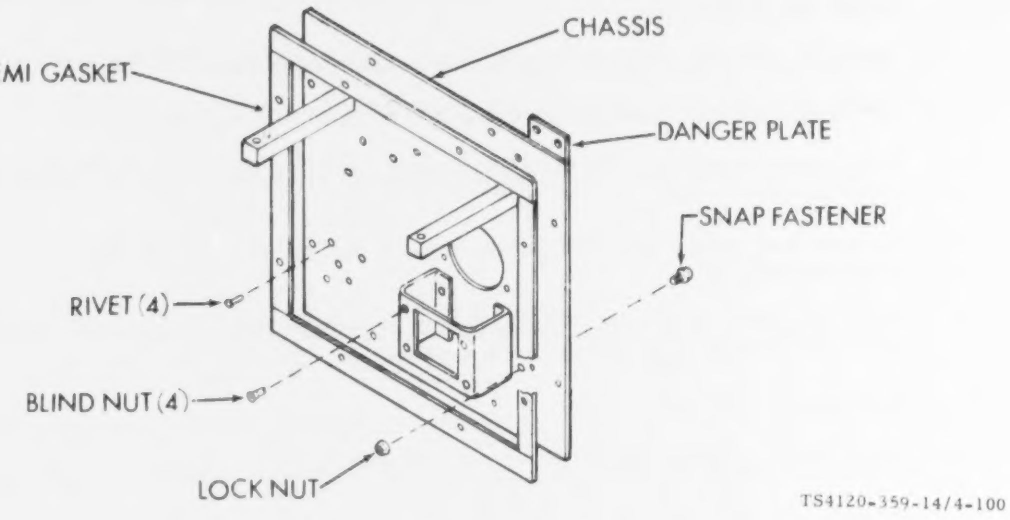


Figure 4-100. Chassis, Electrical Module

(4) Check that danger plate is in place and legible. Replace if missing, damaged, or illegible.

(5) Check that EMI gaskets are not cracked, loose, or missing. Repair if loose. Replace if cracked or missing.

(6) Check general condition of blind nuts and snap fasteners. Repair if loose. Replace if damaged or missing.

b. Repair

(1) If danger plate is damaged:

- Use a drill bit slightly smaller than the diameter of the rivets.
- Drill the rivets out and remove the danger plate.
- Install danger plate with four rivets.

(2) If EMI gasket is missing or damaged:

NOTE

Prior to removal of old gasket material, cut the new replacement material to size using the old material as a sample.

- Remove as much of the old gasket material as possible by pulling or scraping it away from the metal surface.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well ventilated area, wear gloves, and keep away from sparks or flame.

- Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.
- Use only approved replacement materials as specified in TM5-4120-359-24P.
- EMI gasket material specified for this unit is supplied with adhesive backing.
- Cut gasket to size. Be sure that EMI gasket corners are installed so that good continuous edge contact is made.
- Be sure that surface to which gasket is to be applied is clean and free of paint and old adhesive material.
- Remove backing material from adhesive side and immediately press gasket in place. Be sure that good edge to edge contact is made on the EMI gaskets.

(3) If blind nut(s) is damaged.

- Use a drill bit slightly smaller than blind nut body diameter.
- Drill out old blind nut(s).
- Install new blind nut(s).

(4) If snap fastener is damaged.

- Using a screwdriver and wrench, remove old snap fastener and lock nut.
- Install new snap fastener and secure with lock nut.

c. Removal

(1) Remove the following components:

- Time totalizing meter, per paragraph 4-93.
- Relay (K1), per paragraph 4-94.
- Relay (K2), per paragraph 4-95.
- Time delay relay (K6), per paragraph 4-96.
- Terminal board (TB3), per paragraph 4-97.

(2) Using a screwdriver and wrench, remove lock nut and snap fastener.

d. Installation

(1) Using a screwdriver and wrench, secure snap fastener to chassis with lock nut.

(2) Install the following components.

- Time totalizing meter, per paragraph 4-93.
- Relay (K1), per paragraph 4-94.
- Relay (K2), per paragraph 4-95.
- Time delay relay (K6), per paragraph 4-96.

- Terminal board (TB3), per paragraph 4-97.

(3) Position cover on chassis.

(4) Using screwdriver and wrench, secure cover to chassis, with eight screws, six lock nuts, and two lock washers.

Follow-on Procedures: 1. Install condenser section electrical module. (See paragraph 4-90.)

2. Connect power.

4-99. REMOTE CONTROL ASSEMBLY REMOVAL/INSTALLATION

Preliminary Procedure: Disconnect power.

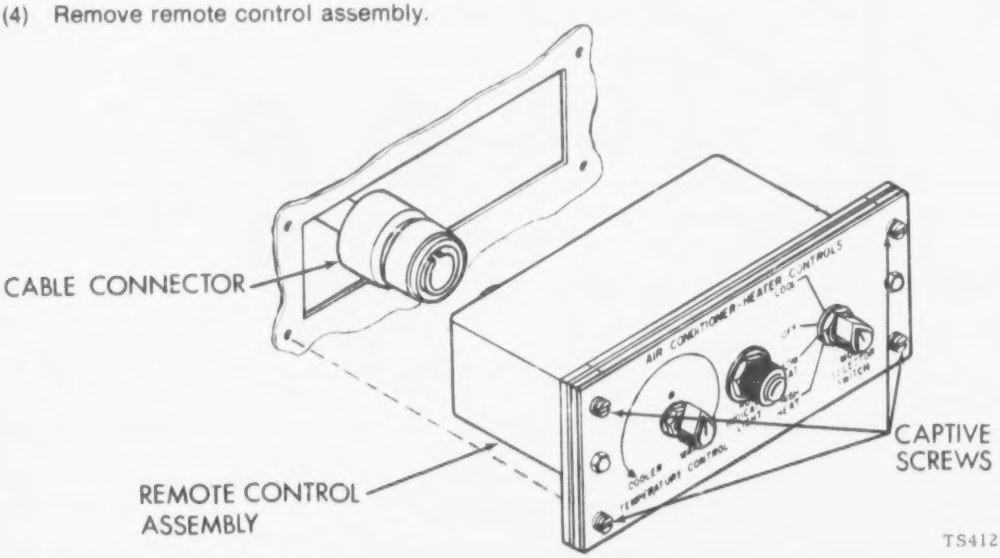
a. Removal (remote control assembly located inside shelter)

(1) Using screwdriver, unscrew four captive screws in corners of remote control assembly.

(2) Pull remote control assembly out from rack to gain access to cable connector on rear.

(3) Disconnect cable connector from remote control assembly.

(4) Remove remote control assembly.



TS4120-359-14/4-101

Figure 4-101. Remote Control Assembly

b. Installation

(1) Position remote control in front of opening in equipment rack in shelter.

(2) Connect cable connector to connector on rear of remote control assembly.

(3) Slip remote control assembly into place on rack.

(4) Using screwdriver, secure remote control to rack with four captive screws.

Follow-on Procedure: Connect power.

4-100. BOX, REMOTE CONTROL

Preliminary Procedures: Remove remote control assembly from shelter. (See paragraph 4-99.)

a. Removal

(1) Using screwdriver and wrench, remove two screws and self locking cap nuts that retain box to cover.

(2) Pull box away from cover as far as wiring harness will allow.

(3) Using screwdriver and wrench, remove four screws, lock washers, and nuts from connector (J14).

(4) Separate the box from the connector (J14). Take care EMI gasket at connector is not lost.

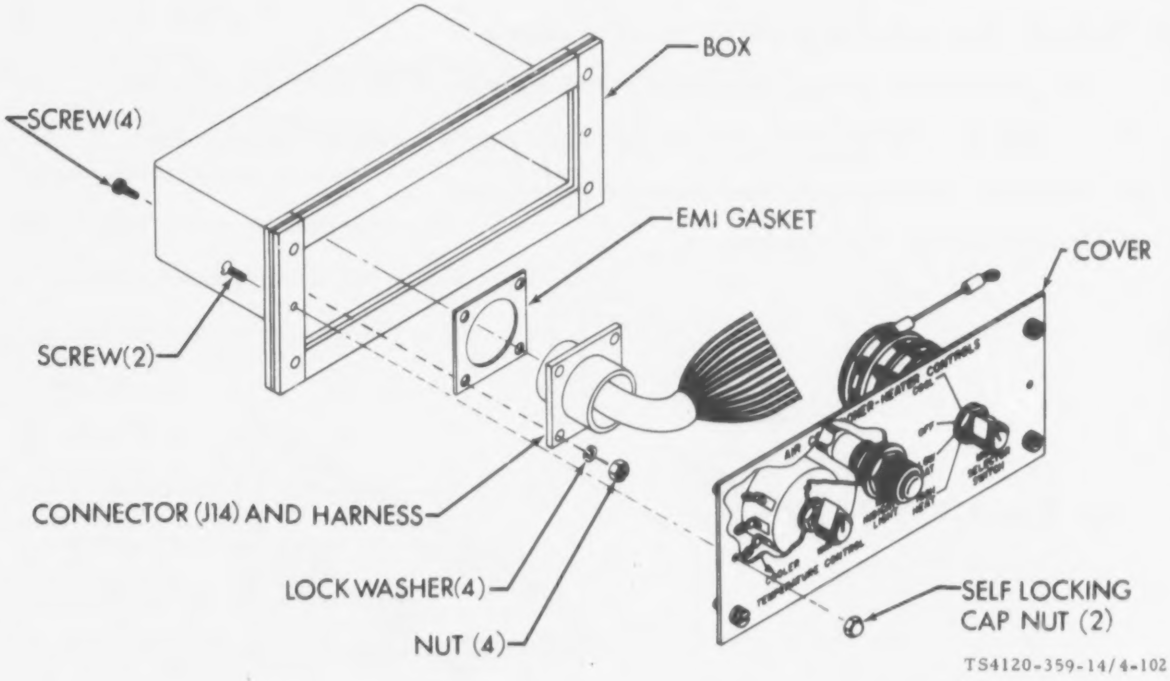


Figure 4-102. Remote Box

b. Inspection

(1) Check that cover is not bent, dented, cracked, or punctured. Replace if damaged.

(2) Check that EMI gaskets on both sides of box mounting flange are in place and in good condition. Replace them if they are loose, cracked, or missing.

c. Repair

NOTE

Prior to removal of the old gasket material, cut the new replacement material to size using the old material as a sample.

(1) Remove as much of the old gasket material as possible by pulling or scraping it away from the metal surface.

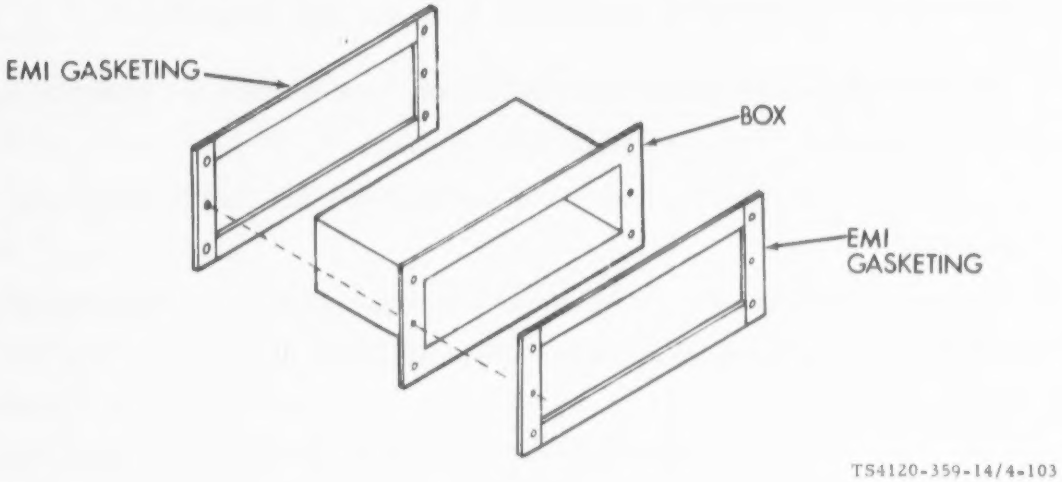


Figure 4-103. Remote Box Repair

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

(2) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

(3) Use only approved replacement material as specified in TM 5-4120-359-24P.

(4) EMI gasket material specified for this unit is supplied with adhesive backing.

(5) Cut gasket to size. Be sure that EMI gasket corners are installed so that good continuous edge contact is made.

(6) Be sure that surface to which gasket is to be applied is clean and free of paint and old adhesive material.

(7) Remove backing material from adhesive side and immediately press gasket in place. *Be sure* that good edge to edge contact is made on the EMI gaskets.

d. Installation

(1) Place EMI gasket on connector (J14) end.

(2) Slip connector (J14) into box and aline holes.

(3) Using screwdriver and wrench, secure connector (J14) to inside of box with four screws, lock washers, and nuts.

(4) Slip box and cover together and aline holes.

(5) Using screwdriver and wrench, secure box to cover with two screws and self locking cap nuts.

Follow-on Procedures: Install remote control assembly in shelter. (See paragraph 4-97.)

4-101. WIRING HARNESS, EMI GASKET, AND ELECTRICAL LEADS — REMOTE CONTROL BOX

Preliminary Procedures: 1. Disconnect power.

2. Remove remote control assembly from shelter. (See paragraph 4-99.)

a. Inspect/Test

(1) Using screwdriver and wrench, remove two screws and self locking cap nuts that retain box to cover.

(2) Pull box away from cover as far as wiring harness will allow.

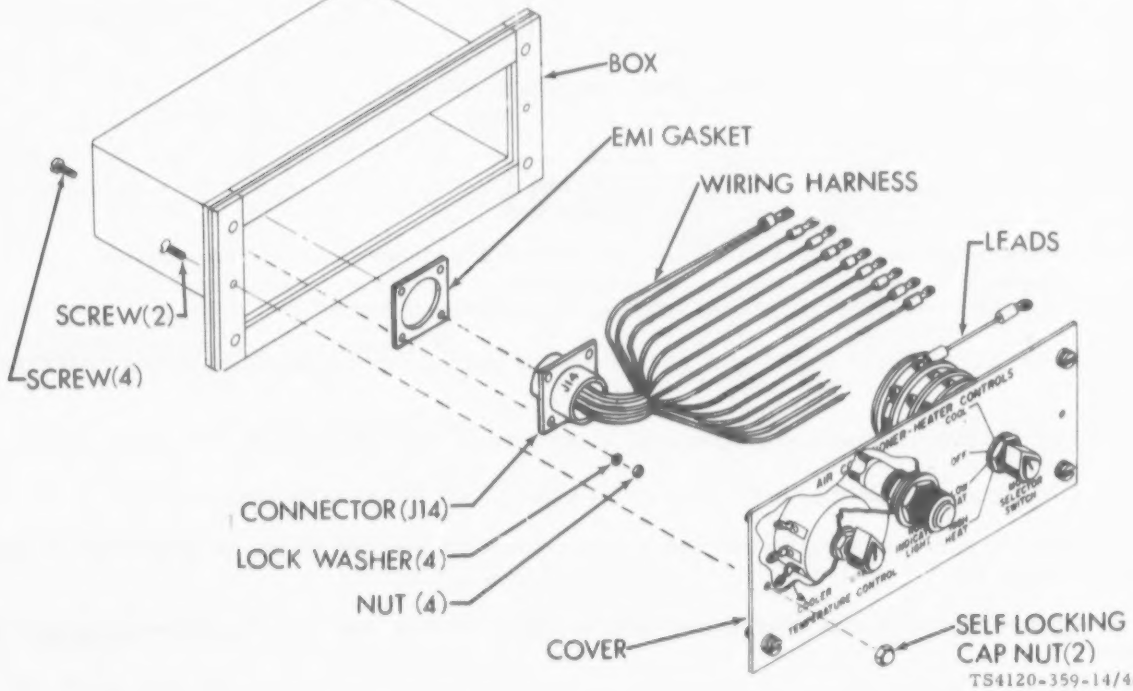


Figure 4-104. Wiring Harness and Leads

(3) Check connector for general condition, loose, broken, or missing pins. Replace connector if damaged.

(4) Check individual wires for loose solder and terminal lug connectors, cut or frayed insulation, and cut or broken wires.

(5) See wiring diagram (figure 4-3) and continuity test individual wires. Repair or replace wires with no continuity.

(6) Check that gasket is in good condition. Replace if torn, missing, or otherwise damaged.

b. Removal

(1) Using screwdriver and wrench, remove four screws, lock washers, and nuts from connector (J14).

(2) Separate the box from the connector (J14), taking care that EMI gasket at connector is not lost.

(3) Tag and disconnect or unsolder leads.

c. Repair

(1) See paragraph 4-3 for general wire repair instructions.

(2) See table 4-2 (Wire List) for wire lengths and terminal information when individual wires are replaced.

d. Installation

(1) See tags and wiring diagram (figure 4-3) and reconnect leads.

(2) Remove tags.

(3) Place EMI gasket on connector (J14) end.

(4) Slip connector (J14) into box and aline holes.

(5) Using screwdriver and wrench, secure connector (J14) in proper position to inside of box with four screws, lock washers, and nuts. (See figure 3-3.)

(6) Slip box and cover together and aline holes.

(7) Using screwdriver and wrench, secure box to cover with two screws and self locking cap nuts.

Follow-on Procedures: Install remote control assembly in shelter. (See paragraph 4-99.)

4-102. DIODE (D1) WITH TERMINAL

Preliminary Procedures: 1. Disconnect power.

2. Remove remote control assembly from shelter. (See paragraph 4-99.)

a. Inspection/Test

(1) Using screwdriver and wrench, remove two screws and self locking cap nuts that retain box to cover.

(2) Pull box away from cover as far as wiring harness will allow.

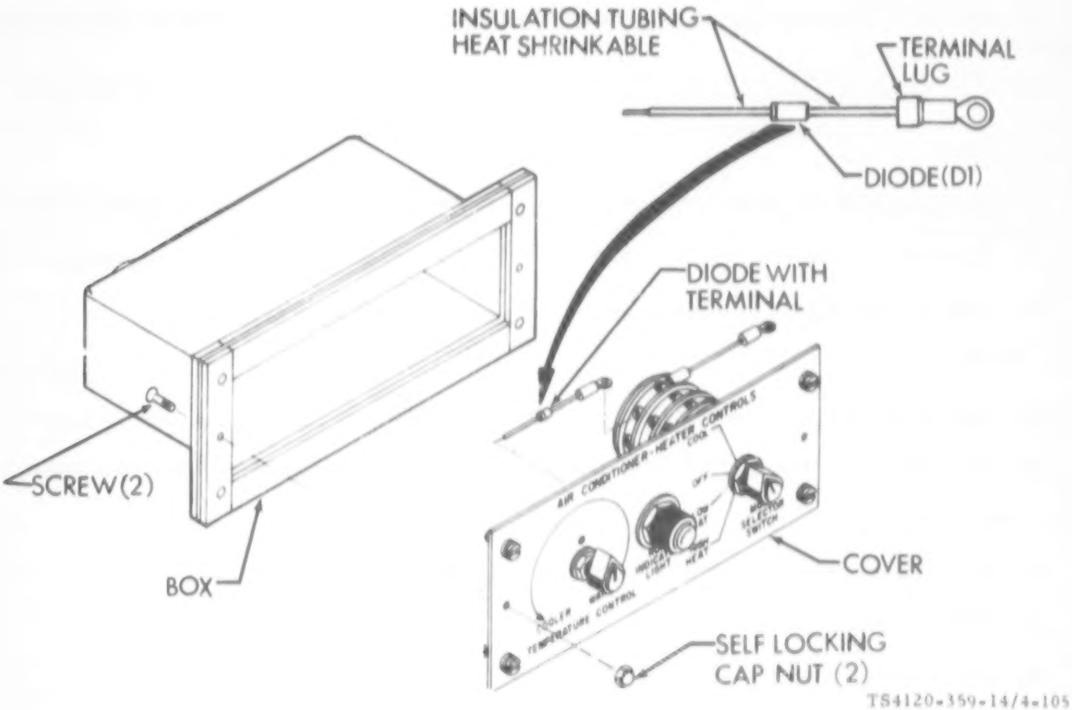


Figure 4-105. Diode with Terminal

(3) Check for loose solder connection or terminal lug.

(4) Check that diode is connected between switch terminal S1-41 and light terminal XDS1-2.

(5) Using multimeter, check diode. Diode (D1) ratio of backward resistance to forward resistance should be not less than 100 to 1.

b. Removal

(1) Disconnect terminal lug at rotary switch.

(2) Unsolder lead at light.

(3) Remove diode and terminal.

c. Repair. Repair is limited to replacement of terminal lug and heat shrinkable insulation tubing. See paragraph 4-3 for general wire repair instructions.

d. Installation

(1) Solder lead to terminal XDS1-2 on light.

(2) Connect terminal lug to terminal S1-41 on rotary switch.

(3) Slip box and cover together and aline solder.

(4) Using screwdriver and wrench, secure box to cover with two screws and self locking cap nuts.

Follow-on Procedures: Install remote control assembly in shelter. (See paragraph 4-99.)

4-103. ROTARY, MODE SELECTOR, SWITCH (S1) AND KNOB

Preliminary Procedures: 1. Disconnect power.

2. Remove remote control assembly from shelter. (See paragraph 4-99.)

a. Inspect

(1) Check that knob is in place, not damaged, and secure. Replace knob if missing, cracked, or broken. Tighten setscrew if knob is loose.

(2) Using screwdriver and wrench, remove two screws and self locking cap nuts that retain box to cover.

(3) Pull box away from cover as far as wiring harness will allow.

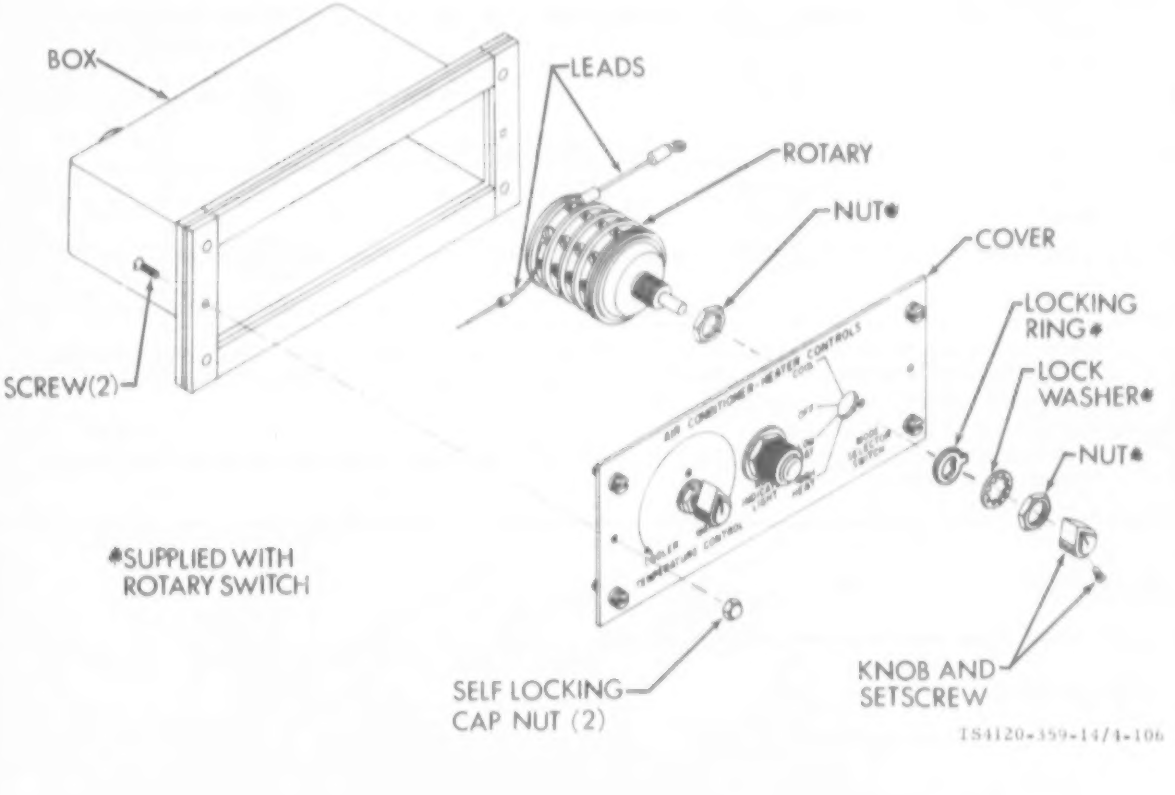


Figure 4-106. Rotary Switch and Knob

(4) Check that lead terminal connections are tight.

b. Test. The mode selector switch can be tested at the J14 connector located on the back of the remote control assembly. Using a multimeter, check for resistance values indicated on the following chart.

Mode	J14 CONNECTOR		Resistance Reading (Ohms) Temperature Control Set To	
	Resistance less than 2 ohms (Pins)	Pins	Maximum WARMER	Maximum COOLER
COOL	A to B	C to H	*	*
	C to N			
	N to D	N to H	*	*
	M to P	J to L	1000	1000
		J to K	1000	0
		K to L	0	1000
OFF	C to N	C to H	*	*
		N to H	*	*
		J to L	1000	1000
		J to K	1000	0
		K to L	100	1000
LOW HEAT	A to B	C to H	*	*
	C to N	N to H	*	*
	M to G	J to L	1000	1000
		J to K	1000	0
		K to L	0	1000
HIGH HEAT	A to B	C to H	*	*
	C to N	N to H	*	*
	C to F	J to L	1000	1000
	M to G	J to K	1000	0
		K to L	0	1000

* Resistance values on multimeter will vary with internal resistance of meter scale used in addition to the forward and backward resistance of diode (D1). Backward to forward resistance ratio of diode (D1) should be approximately 100 to 1.

For example: Resistance from H to C may read 8 ohms and when leads are reversed, read approximately 800 ohms.

c. Removal

(1) Using allen wrench, loosen setscrew in knob.

(2) Remove knob.

(3) Tag and disconnect leads.

(4) Using wrench, remove nut, lock washer, and locking ring from rotary switch.

(5) Remove rotary switch.

d. Installation

(1) Position rotary switch with locking ring, lock washer, and nut. Positioning tab on locking ring must fit into hole in cover.

(2) See tags, wire markings, and wiring diagram (figure 4-3), and reconnect leads.

(3) Remove tags.

(4) Aline knob setscrew with flat portion of rotary switch shaft.

(5) Slip knob onto shaft.

(6) Using allen wrench, tighten knob setscrew.

(7) Slip box and cover together and aline holes.

(8) Using screwdriver and wrench, secure box to cover with two screws and self locking cap nuts.

Follow-on Procedures: Install remote control assembly in shelter. (See paragraph 4-99.)

4-104. RUN INDICATOR LIGHT (XDS1)

NOTE

Lamp may be tested with power on, prior to disassembly by pressing lens cap. (See paragraph 3-30.)

Preliminary Procedures:
1. Disconnect power
2. Remove remote control assembly from shelter. (See paragraph 4-99.)

a. Test/Inspection

(1) Using screwdriver and wrench, remove two screws and self locking cap nuts that retain box to cover.

(2) Pull box away from cover as far as wiring harness will allow.

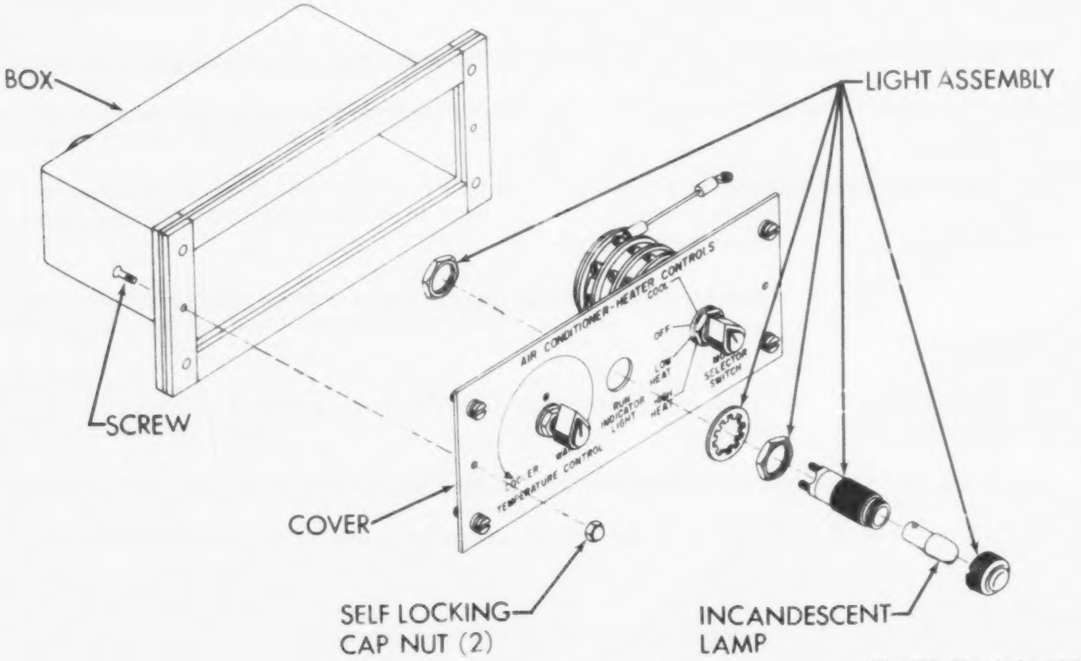


Figure 4-107. Run Indicator Light

best copy available

(3) Check that lens cap is not cracked or broken, mounting hardware is in place and secure, and terminals are not bent or broken. Replace light assembly if damaged.

(4) Unscrew and remove lens cap.

(5) Remove lamp and test lamp for continuity. Replace lamp if it is bad.

(6) Using multimeter, check wire leads and light assembly for continuity, shorts, and opens.

- Switch terminal S1-41 connects to XDS1-2 through diode D1. Diode D1 ratio of backward resistance to forward resistance should be not less than 100 to 1.
- Light assembly terminal 1 connects to terminal 2 internally through lamp.
- Terminal 3 connects to terminal 2 and lamp *only when lamp cover is pushed*.

b. Removal

(1) Using wrench, remove nut and lock washer from front of light assembly.

(2) Tag and unsolder leads.

(3) Pull remaining light assembly parts from cover.

c. Installation

(1) Using wrench, secure light assembly to cover with nuts and lock washer.

(2) See tags, wire markings and wiring diagram (figure 4-3) and solder leads.

(3) Install lamp and lens cover.

(4) Slip box and cover together and aline holes.

(5) Using screwdriver and wrench, secure box to cover with two screws and self locking cap nuts.

Follow-on Procedure: Install remote control assembly in shelter. (See paragraph 4-99.)

4-105. TEMPERATURE CONTROL (A1-R1)

Preliminary Procedures: 1. Disconnect power.

2. Remove remote control assembly from shelter. (See paragraph 4-99.)

a. Inspect/Test

(1) Check that knob is in place, not damaged and secure. Replace knob if missing, cracked, or broken. Tighten setscrew if knob is loose.

(2) Using screwdriver and wrench, remove two screws and self locking cap nuts that retain box to cover.

(3) Pull box away from cover as far as wiring harness will allow.

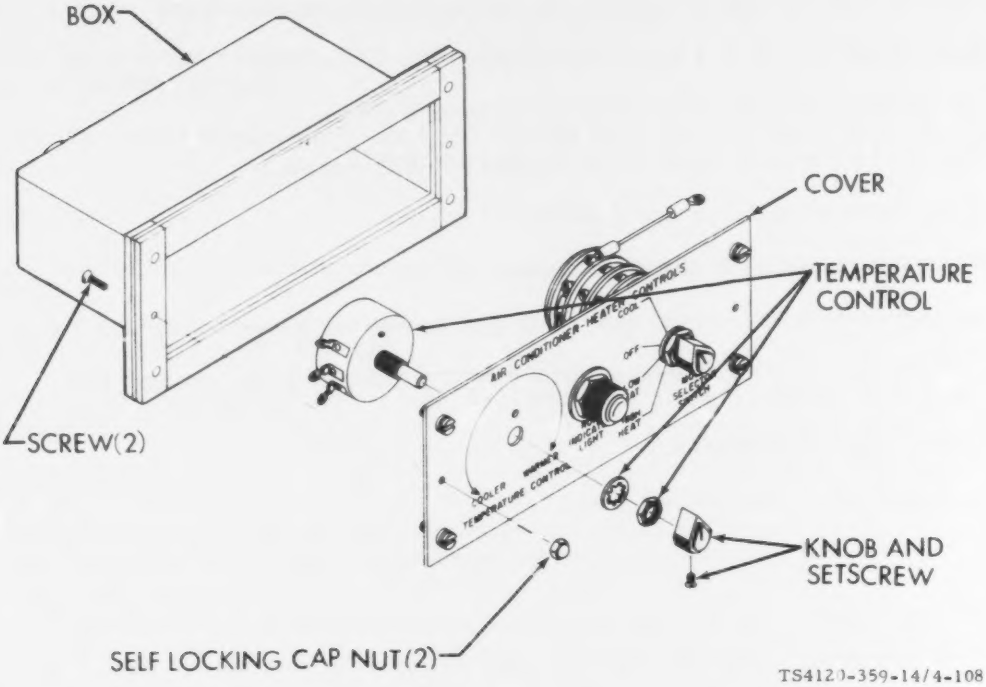


Figure 4-108. Temperature Control

(4) Check that leads are connected, terminals are not bent or broken, and for evidence of overheating. Replace temperature control if damaged.

(5) Using multimeter, check wire leads and temperature control for continuity shorts and opens.

- Temperature control (AR1) CW terminal to CCW terminal internal resistance across pins L and J is approximately 1,000 ohms.
- Temperature control (A1R1) COM terminal to CW terminal internal resistance across pins K and L varies fom 0 to 1,000 ohms at turn of shaft.

b. Removal

(1) Using allen wrench, loosen setscrews in knob.

(2) Remove knob.

(3) Tag and unsolder leads.

(4) Using wrench, remove nut and lock washer from temperature control.

(5) Remove temperature control.

c. Installation

(1) Place temperature control shaft and positioning tab through holes in cover.

(2) Using wrench, secure temperature control with lock washers and nut.

(3) See tags, wire markings, and wiring diagram (figure 4-3), and solder leads.

(4) Remove tags.

(5) Turn temperature control shaft clockwise as far as it will go.

(6) Slip knob on shaft with pointer to the extreme WARMER position.

(7) Using allen wrench, tighten knob setscrew.

(8) Slip box and cover together and aline holes.

(9) Using screwdriver and wrench, secure box to cover with two screws and self locking cap nuts.

Follow-on Procedures: 1. Install remote control assembly in shelter. (See paragraph 4-99.)

4-106. COVER, REMOTE CONTROL

Preliminary Procedures: 1. Disconnect power.

2. Remove remote control assembly from shelter. (See paragraph 4-99.)

a. Access

(1) Using screwdriver and wrench, remove two screws and self locking cap nuts that retain box to cover.

(2) Pull box away from cover as far as wiring harness will allow.

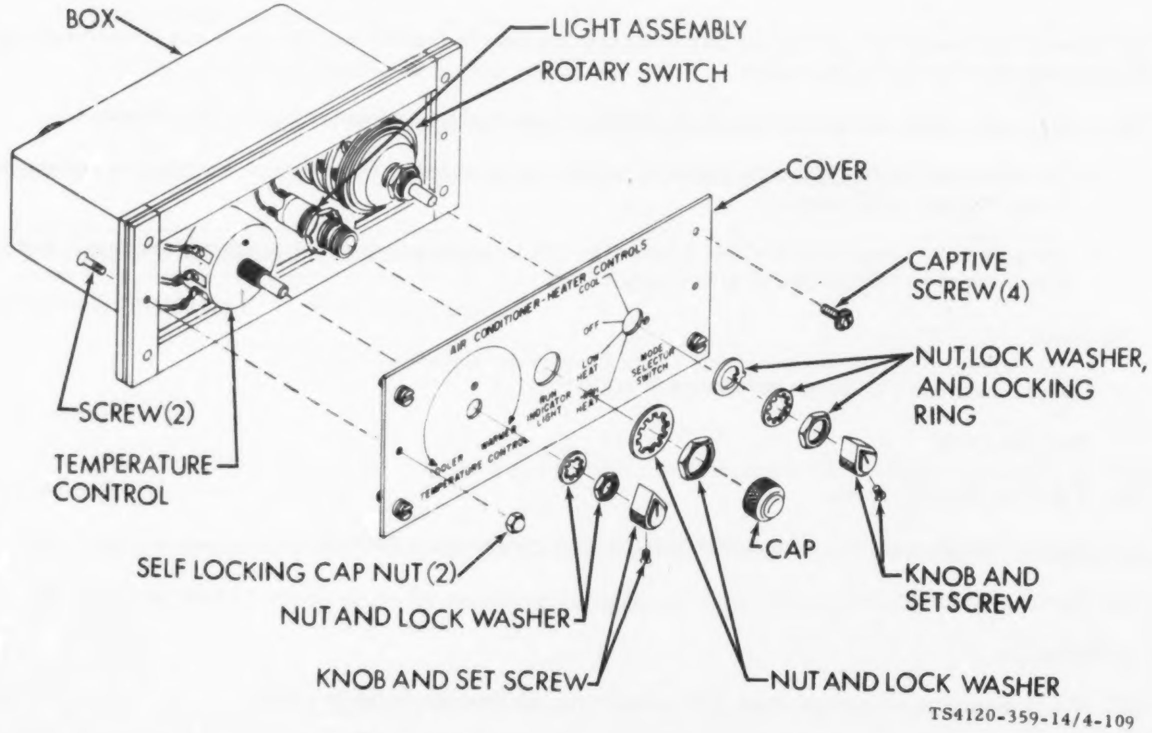


Figure 4-109. Cover, Remote Control

b. Inspect

(1) Check that cover is not cracked, bent, pierced and that all marking is legible. Replace if damaged or outside face plate marking is illegible.

(2) Check that captive screws are in place and not damaged. Replace them if they are missing or damaged.

c. Removal/Repair

(1) Using allen wrench, loosen setscrew and remove knobs from temperature control and rotary mode selector switch.

(4) Remove lens cap from light assembly.

(3) Using wrench, remove attaching hardware from rotary mode selector switch, light assembly, and temperature control.

(4) Remove the cover.

(5) If captive screws are missing or damaged, install new ones.

NOTE

Installation tool (08524) H7503-8 is required for captive screw installation. Place captive screw through hole in cover. Turn captive screw into nose threads of installation tool. Squeeze installation tool handles together firmly. Unscrew installation tool.

d. Installation

(1) Position rotary switch through hole in cover.

(2) Using wrench, secure rotary switch with locking ring, lock washer, and nut. Positioning tab on locking ring must fit into hole in cover.

(3) Aline rotary switch knob setscrew with flat portion of rotary switch shaft.

(4) Slip knob onto rotary switch shaft.

(5) Using allen wrench, tighten rotary switch knob setscrew.

(6) Using wrench, secure light assembly to cover with nut and lock washer.

(7) Screw lens cover onto light assembly.

(8) Place temperature control shaft and positioning tab through holes in cover.

(9) Using wrench, secure temperature control with lock washer and nut.

(10) Turn temperature control shaft clockwise as far as it will go.

(11) Slip knob on temperature control shaft with pointer to the extreme WARMER position.

(12) Using allen wrench, tighten temperature control knob setscrew.

(13) Slip box and cover together and aline holes.

(14) Using screwdriver and wrench, secure box to cover with two screws and self locking cap nuts.

Follow-on Procedures: Install remote control assembly in shelter. (See paragraph 4-99.)

CHAPTER 5

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

5-1. GENERAL

Repair parts are listed and illustrated in TM 5-4120-359-24P. No special tools are required for general support maintenance of the air conditioner. Test, maintenance, and diagnostic equipment (TMDE), and support equipment, includes standard electrical test equipment, and standard pressure and vacuum gages, vacuum pumps, and servicing manifolds found in any general support maintenance refrigeration facility.

Section II AUTHORIZED GENERAL SUPPORT MAINTENANCE ACTIONS

5-2. GENERAL

The only items restricted to general support maintenance level by the Maintenance Allocation Chart (MAC are the repair or replacement of insulation or lifting fittings on the evaporator and condenser housings. However, general support maintenance may be called upon, at times, to perform any or all of the MAC items listed for organizational and direct support maintenance for rehabilitation or overhaul of an air conditioner.

5-3. EVAPORATOR AND CONDENSER HOUSINGS

a. Repair

(1) Repairs are limited to rework of broken or cracked welds, straightening of bent or dented sheet metal, replacement of lifting fittings, gaskets, insulation and plate nuts, and some small sheet metal parts by drilling out rivets and installation of replacement parts.

(2) Disassemble unit as necessary and make repair as indicated.

(3) Insulation replacement

(a) Use only insulation identified in TM 5-4120-359-24P.

(b) Remove as much old insulation material as possible by pulling or scraping it away from the metal surface.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

(c) Soften and remove old adhesive and insulation residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

(d) Coat the mating surfaces of the metal and insulation with adhesive, item 12, Appendix E. Let both surfaces air dry until the adhesive is tacky but will not stick to fingers.

(e) Starting with an end, carefully attach the insulation to the metal. Press into firm contact all over.

(4) Minor dents and bent edges can be straightened using common sheet metal repair procedures.

(5) Should touch up or refinishing be necessary, see TM 43-0139.

b. Replacement

(1) Housing replacement requires total unit disassembly. Normally if the unit is damaged to this extent, it should be replaced.

(2) If housing replacement is attempted, see individual installation instructions of components for reinstallation of items removed.

APPENDIX A

REFERENCES

A-1. SCOPE

This Appendix lists all forms, field manuals, technical manuals, and miscellaneous publications referenced in this manual.

A-2. FORMS

DA Form 2028-2	Recommended Changes to DA Publications
DA Form 2404	Equipment Inspection and Maintenance Work Sheet
SF 368	Quality Deficiency Report

A-3. FIELD MANUALS

FM20-31	Electric Motor and Generator Repair

A-4. MANUALS

TB5-4200-200-10	Hand Portable Fire Extinguishers Approved for Army Users
TM11-483	Radio Interference Suppression
TM38-750	The Army Maintenance Management System
TM43-0139	Painting Instructions for Field Use
TM5-4120-359-14-HR	Hand Receipt Manual
TM5-4120-359-24P	Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools List
TM740-90-1	Administrative Storage of Equipment
TM750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use
TM9-4940-435-14	Leak Detector, Refrigerant Gas

A-5. MISCELLANEOUS PUBLICATIONS

C91001L	Fuels, Lubricants, Oils, and Waxes.

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I INTRODUCTION

B-1. GENERAL

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2. MAINTENANCE FUNCTIONS

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination (e.g. by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the third position code of the SMR code.

i. Repair. The application of maintenance services[1], including fault location/troubleshooting[2], removal/installation, and disassembly/assembly[3] procedures, and maintenance actions[4] to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be "00."

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B-2.)

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific task identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

C	Operator or Crew
O	Organizational Maintenance

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[1] Services — Inspect, test, service, adjust, aline, calibrate, and/or replace.

[2] Fault locate/troubleshoot — the process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

[3] Disassembly/assemble — encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least componency identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.

[4] Actions — welding, grinding, riveting, straightening, facing, remachinery, and/or resurfacing.

F	Direct Support Maintenance
H	General Support Maintenance
D	Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in Section IV.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2, Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

B-5. EXPLANATION OF COLUMNS IN SECTION IV

a. Column 1, Reference Code. The code recorded in column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
01	Miscellaneous Final Assy Items								
	Hook Retainer	Inspect		0.1					
		Replace		0.1					
	Cord Elastic	Inspect		0.1					
		Adjust		0.1					
		Replace			0.5				
	Filter Air Conditioning (Fresh Air)	Inspect		0.1					
		Service		0.2					
		Replace		0.1					
	Duct Fresh Air	Inspect		0.1					
		Repair			1.0				A
		Replace		0.1					
02	Evaporator Assy								
	Cover Access	Inspect		0.1					
		Repair			1.0				A
		Replace		0.1					
	Plug Drain	Inspect		0.1					
		Replace		0.1					
	Protective Electrical Caps and Covers	Inspect		0.1					
		Replace		0.1					
	Filter Radio Freq & Gasket	Inspect			0.1				
		Test			0.2				
		Replace			0.2				
	Cover Front Evap	Inspect		0.1					
		Repair			1.0				B
		Replace		0.5					
	Evap Return EMI Screen	Inspect			0.1				
		Service			0.5				
		Replace			0.3				
	Frame Return Air	Inspect		0.1					
		Repair			1.0				A
		Replace		0.3					

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MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
02 Contd	Evap Disch EMI Screen	Inspect			0.1				
		Service			0.5				
		Replace			0.3				
	Frame Evap Disch	Inspect		0.1					
		Repair			1.0				A
		Replace		0.3					
	Plates Info & Ident	Inspect		0.1					
		Replace			0.7				
	Fresh Air EMI Screen	Inspect			0.1				
		Service		0.5	0.5				
		Replace			0.3				
	Cover Fresh Air	Inspect		0.1					
		Repair			0.5				B
		Replace		0.1					
	Cover Top Evap	Inspect		0.1					
		Repair			1.0				B
		Replace		0.5					
	Harness Wiring	Inspect			0.1				
		Test			0.5				
		Repair			1.0				
		Replace			0.5				
	Connector Thru Bulkhead	Inspect			0.1				
		Test			0.1				
		Replace			1.0				
	Gasket Receptacle	Inspect			0.1				
		Replace			1.0				
	Probe Air Sensing	Inspect			0.1				
		Test			0.3				
		Repair			0.3				
		Service			0.1				
		Replace			0.5				
	Inlet Fan	Inspect			0.1				
		Replace			1.0				

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Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
02 Contd	Impeller Fan	Inspect			0.1				
		Service			0.3				
		Adjust			0.5				
		Replace			1.0				
	Blower Housing	Inspect			0.1				
		Replace			1.0				
	Shaft Extension	Inspect			0.1				
		Repair			0.3				
		Replace			1.0				
	Base Motor & Blower	Inspect			0.1				
		Repair			0.5				
		Replace			1.5				
	Motor AC	Inspect			0.2				
		Test			0.3				
		Repair			1.0				C
		Disassemble			1.0				
		Replace			1.0				
	Switch Thermostatic	Inspect			0.1				
		Test			0.5				
		Replace			1.0				
	Terminal Board	Inspect			0.1				
		Replace			2.0				
	Support Terminal Board	Inspect			0.1				
		Repair			0.5				
		Replace			3.0				
	Heating Elem Elec	Inspect			0.1				
		Test			0.3				
		Service			0.3				
		Replace			2.0				
	Grommet Heater Insul	Inspect			0.1				
		Replace			2.0				
	Bracket Heat Elem	Inspect			0.1				
		Replace			3.0				

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Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
02 Contd	Coil Evap	Inspect			0.1				
		Test			0.3				
		Repair			0.5				
		Service			0.3				
		Replace			2.0				
	Coupling Half	Inspect			0.1				
		Test			0.3				
		Repair			1.0				
		Disassemble			1.0				
		Replace			1.0				
	Valve Expansion	Inspect			0.1				
		Test			1.0				
		Disassemble			1.0				
		Adjust			1.0				
		Replace			2.0				
	Tubing & Fittings	Inspect			0.1				
		Test			0.8				
		Disassemble			1.0				
		Replace			2.0				
	Tubing Rubber	Inspect			0.1				
		Test			0.2				
		Service			0.3				
		Replace			0.8				
	Housing Evap Sect	Inspect				0.2			
		Repair				1.0			D
		Disassemble				1.0			
		Replace				16.0			
	Insulation	Inspect			0.1				
		Replace			1.0				
03	Elec Module Assy Evap Sect								
	Grommet	Inspect			0.1				
		Replace			0.1				
	Cover	Inspect			0.1				
		Repair			1.0				A
		Replace			0.2				

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MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
03 Contd	Harness Wiring	Inspect			0.1				
		Test			1.0				
		Repair			1.0				
		Disassemble			0.5				
		Replace			0.5				
	Gasket EMI Receptacle	Inspect			0.1				
		Replace			0.2				
	Leads Elec	Inspect			0.1				
		Test			1.0				
		Repair			0.5				
		Replace			0.5				
	Splice Disconnect	Inspect			0.1				
		Test			0.1				
		Service			0.1				
		Replace			0.1				
	Screw Module Mounting	Inspect			0.1				
		Repair			0.1				
		Disassemble			0.1				
		Replace			0.2				
	Varistor	Inspect			0.1				
		Test			0.1				
		Replace			0.5				
	Transformer	Inspect			0.1				
		Test			0.2				
		Replace			0.7				
	Control Temperature	Inspect			0.1				
		Test			0.5				
		Replace			0.7				
	Fuse & Holder	Inspect			0.1				
		Test			0.2				
		Replace			0.5				
	Capacitor	Inspect			0.1				
		Test			0.3				
		Replace			0.5				

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MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
03 Contd	Rectifier	Inspect			0.5				
		Test			0.3				
		Replace			0.8				
	Relay	Inspect			0.1				
		Test			0.5				
		Replace			0.7				
	Jumper Terminal Board	Inspect			0.1				
		Replace			0.1				
	Terminal Board	Inspect			0.1				
		Replace			0.7				
	Chassis	Inspect			0.1				
		Repair			1.0				
		Disassemble			3.0				
		Replace			3.0				
04	Condenser Assy								
	Cover Feed Through	Inspect		0.1					
		Repair			0.5				A
		Replace		0.1					
	Cover Front	Inspect		0.1					
		Repair			0.8				A
		Replace		0.3					
	Cover Condenser	Inspect		0.1					
		Repair			0.8				
		Service		0.3					
		Replace		0.1					
	Cover Top	Inspect		0.1					
		Repair			1.0				A
		Replace		0.3					
	Info Plates	Inspect		0.2					
		Replace			0.5				
	Cover Right End	Inspect		0.1					
		Repair			0.5				A
		Replace		0.2					

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
04 Contd	Cover Left End	Inspect		0.1					
		Repair			0.5				A
		Replace		0.2					
	Guard Condenser	Inspect		0.1					
		Repair			0.5				
		Replace		0.3					
	Fasteners Snap	Inspect		0.1					
		Replace			0.3				
	Condenser Inlet EMI Screen	Inspect			0.1				
		Service			0.5				
		Replace			0.3				
	Grille Condenser Discharge	Inspect		0.1					
		Repair			0.5				
		Replace		0.2					
	Condenser Disch EMI Screen	Inspect			0.1				
		Service			0.5				
		Replace			0.3				
	Harness Wiring	Inspect			0.1				
		Test			0.5				
		Repair			1.0				
		Disassemble			1.0				
		Replace			1.0				
	Leads Electrical	Inspect			0.1				
		Test			0.1				
		Repair			0.5				
		Replace			0.1				
	Varistor with Terminal	Inspect			0.1				
		Test			0.1				
		Repair			0.3				
		Replace			0.2				
	Terminal Board TB4	Inspect			0.1				
		Replace			0.7				
	Control Assy Push-Pull	Inspect			0.1				
		Service			0.2				
		Replace			1.0				

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
04 Contd	Outlet Vane Lever	Inspect			0.1				
		Replace			1.0				
	Outlet Vane	Inspect			0.1				
		Service			0.5				
		Adjust			0.2				
		Replace			1.0				
	Impeller Fan	Inspect			0.1				
		Repair			0.1				
		Service			0.3				
		Adjust			0.3				
		Replace			1.0				
	Shaft Extension	Inspect			0.1				
		Repair			0.3				
		Replace			1.0				
	Inlet Fan	Inspect			0.1				
		Replace			2.0				
	Blower Housing	Inspect			0.1				
		Repair			0.3				
		Replace			2.0				
	Motor AC	Inspect			0.2				
		Test			0.3				
		Repair			1.0				C
		Disassemble			1.0				
		Service			0.1				
		Replace			1.0				
	Hose Assy Discharge	Inspect			0.2				
		Test			0.2				
		Repair			2.0				
		Disassemble			2.0				
		Service			0.1				
		Replace			1.0				
	Hose Assy Duct Flex	Inspect			0.2				
		Test			0.2				
		Repair			2.0				
		Disassemble			2.0				
		Service			0.1				
		Replace			1.0				

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
04 Contd	Coupling Half Male	Inspect			0.2				
		Test			0.2				
		Repair			2.0				
		Disassemble			2.0				
		Replace			1.0				
	Cap and Chain	Inspect			0.1				
		Service			0.1				
		Replace			0.2				
	Service Valve	Inspect			0.1				
		Test			0.2				
		Replace			1.0				
	Terminal Quick Disc	Inspect			0.1				
		Test			0.1				
		Replace			0.2				
	Splice Disconnect	Inspect			0.1				
		Test			0.1				
		Service			0.1				
		Replace			0.1				
	Valve Solenoid	Inspect			0.1				
		Test			0.3				
		Repair			0.5				
		Disassemble			1.0				
		Replace			1.0				
	Mounting Bracket Solenoid Valve	Inspect			0.1				
		Repair			0.5				
		Replace			0.5				
	Glass Sight	Inspect		0.1	0.1				
		Test			0.2				
		Replace			2.0				
	Dehydrator	Inspect			0.1				
		Replace			1.0				
	Receiver Liquid Refrigerant	Inspect			0.1				
		Replace			3.0				
	Cylinder Actuating	Inspect			0.1				
		Test			0.3				
		Service			0.1				
		Replace			2.0				

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITICNER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
04 Contd	Bracket Actuator	Inspect			0.1				
		Replace			0.7				
	Valve Expansion	Inspect			0.1				
		Test			0.3				
		Disassemble			0.5				
		Adjust			1.0				
		Replace			2.0				
	Valve Disch Bypass	Inspect			0.1				
		Test			1.0				
		Adjust			1.0				
		Replace			2.0				
	Bracket Valve Mounting	Inspect			0.1				
		Repair			0.5				
		Replace			0.5				
	Switch High Pressure	Inspect			0.1				
		Test			0.2				
		Replace			2.0				
	Switch Low Pressure	Inspect			0.1				
		Test			0.2				
		Replace			2.0				
	Valve Pressure Relief	Inspect			0.1				
		Test			0.2				
		Replace			2.0				
	Coil Condenser	Inspect			0.1				
		Test			0.2				
		Repair			0.5				
		Service			0.3				
		Replace			3.0				
	Insulation	Inspect			0.1				
		Replace			0.7				
	Tubing & Fitting	Inspect			0.3				
		Test			0.7				
		Repair			2.0				
		Disassemble			2.0				
		Replace			2.0				

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
	Mount Resilient	Inspect			0.1				
		Replace			0.7				
	Compressor	Inspect			0.1				
		Test			0.7				
		Repair			1.0				E
		Service			1.0				
		Replace			4.0				
	Housing Condenser Assy	Inspect			0.2				
		Repair				1.0			F
		Disassemble				1.0			
		Replace				16.0			
05	Elec Module Assy Condenser Section								
	Cover Module	Inspect			0.1				
		Replace			0.8				
	Gasket EMI Receptacle	Inspect			0.1				
		Replace			0.5				
	Harness Wiring	Inspect			0.5				
		Test			1.0				
		Repair			0.5				
		Disassemble			0.7				
		Replace			0.5				
	Lead Electrical	Inspect			0.1				
		Test			0.1				
		Repair			0.2				
		Replace			0.1				
	Meter Time Total	Inspect		0.1					
		Test			0.1				
		Replace			0.8				
	Relays	Inspect			0.1				
		Test			0.5				
		Replace			0.5				
	Terminal Board	Inspect			0.1				
		Replace			0.5				

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
	Link Terminal Board	Inspect			0.1				
		Replace			0.1				
	Fasteners, Snap	Inspect			0.1				
		Replace			0.3				
	Chassis	Inspect			0.2				
		Repair			0.8				
		Disassemble			1.0				
		Replace			1.0				
06	Remote Control Assy								
	Box	Inspect			0.5				
		Repair			1.0				
		Replace			0.5				
	Gasketing EMI	Inspect			0.1				
		Replace			0.5				
	Harness Wiring	Inspect			0.3				
		Test			0.5				
		Repair			0.7				
		Disassemble			0.7				
		Replace			0.7				
	Leads Electrical	Inspect			0.1				
		Test			0.3				
		Repair			0.5				
		Disassemble			0.3				
		Replace			0.3				
	Diode with Terminal	Inspect			0.1				
		Test			0.3				
		Repair			0.3				
		Replace			0.3				
	Knobs	Inspect		0.1	0.1				
		Adjust		0.2					
		Replace			0.1				
	Switch Rotary	Inspect			0.1				
		Test			0.5				
		Replace			0.8				

APPENDIX B

Section II

MAINTENANCE ALLOCATION CHART FOR AIR CONDITIONER

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equipment	(6) Remarks
			C	O	F	H	D		
	Light	Inspect		0.1					
		Test		0.1	0.1				
		Repair			0.5				
		Replace		0.1					
	Control Temperature	Inspect			0.1				
		Test			0.3				
		Repair			0.1				
		Adjust			0.1				
		Replace			0.8				
	Cover	Inspect			0.1				
		Repair			0.2			5	
		Replace			0.7				

Section III TOOL AND TEST EQUIPMENT REQUIREMENTS MAINTENANCE ALLOCATION CHART

(1) Tool or Test Equip. Ref. Code	(2) Maintenance Category	(3) Nomenclature	(4) National/NATO stock number	(5) Tool number
		No special tools and test equipment required. Standard tools and test equipment in the following kits are adequate to accomplish the maintenance functions listed in Section II:		
1	O-F-H	Tool kit, service, refrigeration Unit (SC 5180-90-CL-N18)	5180-00-597-1474	(19099) SC5180-90-CL-N18
2	F-H	Soldering Gun Kit	3439-00-930-1638	(11103) 450K4
3	F-H	Pump, Vacuum	4310-00-098-5272	(64484) 1400B
4	O-F-H	Wrecker, 5 Ton		
5		Installation Tool (Remote control box captive screws)	5120-01-015-1422	(08524) H7503-8
6	F-H	Regulator, Nitrogen	4935-00-040-9916	(00742) 231 P12805

Section IV REMARKS
MAINTENANCE ALLOCATION CHART

Reference code	REMARKS
A	Replace gaskets only
B	Replace gaskets and insulation only
C	Replace bearings and electrical connectors only
D	Replace insulation, lifting handles, blind nuts, and plate nuts
E	Replace external components only
F	Replace blind nut and plate nuts only
	Other than those items listed above, there are no supplemental instructions or explanatory remarks required for the maintenance functions listed in Section II. All functions are sufficiently defined in Section I. Active time listed for maintenance task functions are with the air conditioner in off-equipment position.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I INTRODUCTION

C-1. SCOPE

This appendix lists components of end item and basic issue items for the air conditioner to help you inventory items required for safe and efficient operation.

C-2. GENERAL

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the air conditioner in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the air conditioner during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

C-3. EXPLANATION OF COLUMNS

The following provides an explanation of columns found in the tabular listings:

a. Column (1) — Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

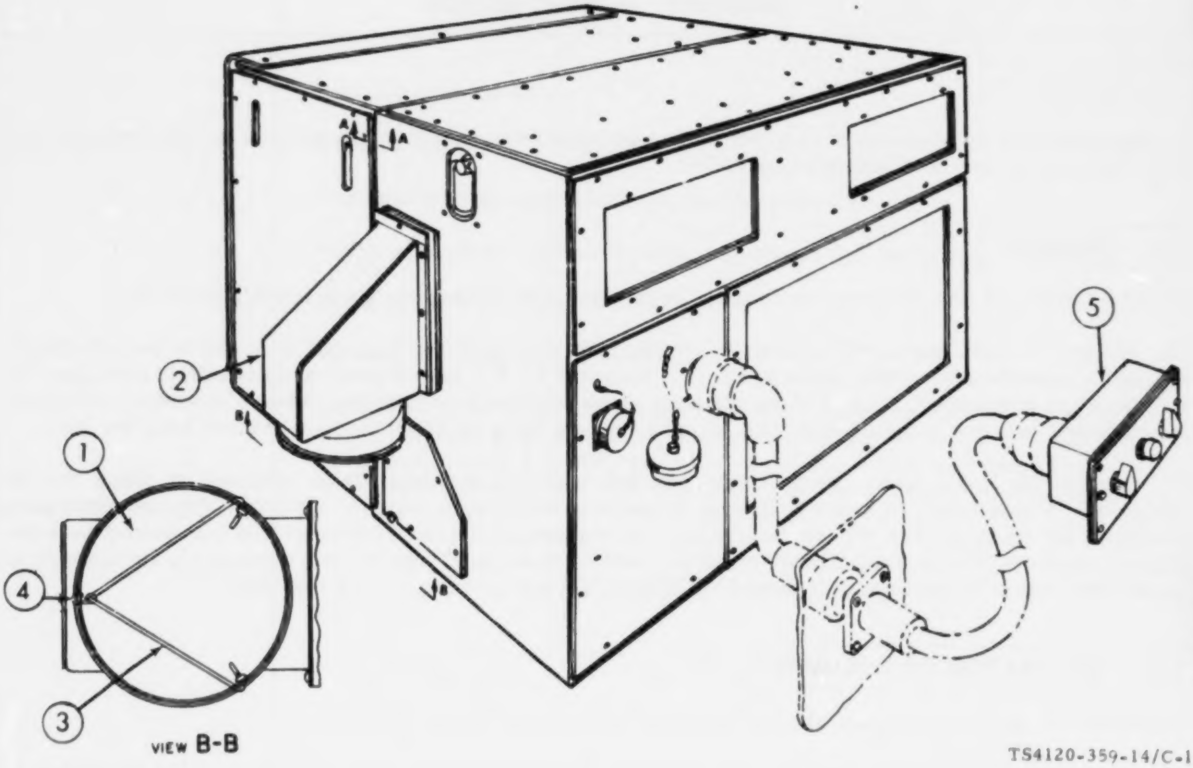
b. Column (2) — National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3) — Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column (4) — Unit of Measure (U/M). Indicates the measure used in performing the actual operation/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. Column (5) — Quantity required (Qty rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II COMPONENTS OF END ITEM



TS4120-359-14/C-1

(1) Illus number	(2) National Stock number	(3) Description FSCM and Part number	Usable On Code	(4) U/M	(5) Qty rqr
1		FILTER, AIR CONDITIONING (97403) 13219E9525-2		EA	1
2		DUCT, FRESH AIR (97403) 13221E9150		EA	1
3		CORD, ELASTIC (97403) 13219E9556		EA	1
4		HOOK, FILTER RETAINER (97403) 13221E9148		EA	1
5		REMOTE CONTROL ASSY (97403) 13221E9111		EA	1

Section III BASIC ISSUE ITEMS

(1) Illus number	(2) National Stock number	(3) Description FSCM and Part number	Usable On Code	(4) U/M	(5) Qty rqr
		Department of Army Technical Manual; Operator's Organizational, Direct Support, and General Support Maintenance Manual TM 5-4120-359-14		EA	1
		Department of Army Technical Manual; Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools List TM 5-4120-359-24P		EA	1
	5220-00-559-9618	Case, Manual		EA	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section I INTRODUCTION

D-1. SCOPE

This appendix lists additional items you are authorized for the support of the air conditioner.

D-2. GENERAL

This list identifies items that do not have to accompany the air conditioner and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

D-3. EXPLANATION OF LISTING

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorized the item(s) to you.

Section II ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Description FSCM & Part Number	Usable on code	(3) U/M	(4) Qty Auth
	Remote Cable Assembly(s) as applicable			
	(18876) 11455976-1		EA	A/R
	(18876) 11455976-2		EA	A/R
	(18876) 11455977-1		EA	A/R
	(18876) 11566977-2		EA	A/R
	Note that the 11455976-1 or -2 cables may be used by themselves and that the 1145977-1 or -2 cables must be used with a 11455976-1 or -2 cable.			
	POWER CABLE (18876) 11453295		EA	1
	SCREW (96906) MS51958-97		EA	8
	WASHER, LOCK (96906) MS35335-62		EA	8
	NUT, SELF LOCKING (96906) MS21044C5		EA	8
	GROUNDING STRAP (18876) 14455133		EA	8
	SCREW, HEX HD (96906) MS35307-338		EA	8
	WASHER, FLAT (18876) 11447172-2		EA	16
	RESILIENT MOUNTS (18876) 11447981		EA	16
	WASHER, FLAT (18876) 11447173		EA	16
	WASHER, FLAT (18876) 11447172-1		EA	8

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I INTRODUCTION

E-1. SCOPE

This appendix lists expendable supplies and materials you will need to operate and maintain the Air Conditioner. These items are authorized to you by CTA50-970, Expendable items (except Medical, Class V, Repair Parts, and Heraldic items).

E-2. EXPLANATION OF COLUMNS

a. Column (1) — Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Under solder, Item 1, App. E").

b. Column (2) — Level. This column identifies the lowest level of maintenance that requires the listed item.

C — Operator/Crew
O — Organizational Maintenance
F — Direct Support Maintenance
H — General Support Maintenance

c. Column (3) — National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) — Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column (5) — Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II
EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	F		Solder, Lead-Tin , QQ-S-571, type SN60WRP2	
2	F	6830-00-292-0732	Nitrogen	cy
3	F		Brazing alloy, silver QQ-B-564, grade O, I or II	
4	F		Brazing alloy, silver QQ-B-564, grade III	
5	F	3439-00-640-3713	Flux, brazing O-F-499, type B	
6	F	5350-00-192-5047	Abrasive cloth	pg
7	F	7920-00-205-1711	Rags	
8	F	6850-00-837-9927	Monochlorodifluoromethane, Technical: w/cylinder 22 lb. (Refrigerant-22) BB-F-1421, type 22 (81348)	cy
9	F		Primer, Yellow MIL-P-52192 or TT-P-1757	
10	F		Enamel, forest green MIL-E-52798	
11	F		Adhesive, liquid epoxy resin base, general purpose MMM-A-187, type 2	pt
12	F	3040-00-664-0439	Adhesive, General Purpose 1 pint container	ea
13	F		Lubricating Oil VV-L-825, type IV	
14	F		Tape, Insulation 13219E9543 (97403) 165 (77464)	roll
15	F		Sealing Compound, locking and retaining, single component MIL-S-22473, grade CV	
16	F	8030-00-889-3534	Tape, Antisieze, Polytetrafluroethylene MIL-T-27730, size 1	roll
17	F	6830-00-872-5120	Trichloromonofluromethane Technical: w/cylinder 50 Lb. (Refrigerant-11) BB-F-1421 Type II (81348)	cy
18	F	9150-00-058-2301	Oil, Vacuum pump, Duo-seal	qt

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By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
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PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER TM 5-4120-359-14

PUBLICATION DATE 25 Feb 82

PUBLICATION TITLE Air Conditioner Split package 18,000 BTU/HR Cooling 30,000 BTU/HR Heating

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 Cylinders. The engine on my set only has 4 Cylinders. Change the manual to show 4 Cylinders.
81		4-3		Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is Called a shim - Please Correct one or the Other.
125	line		20	I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got What I ordered, so the NSN is Wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

JOHN DOE, PFC (268) 317-7111

SIGN HERE John Doe
JOHN DOE

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.365	metric tons	short tons	1.102
pound-inches	newton-meters	.11375			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C